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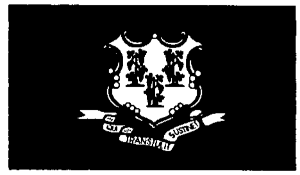

Connecticut

LTPP Specific Pavement Studies

Construction Report on
LTPP 090900,
SPS-9A Project,
Colchester, CT, Summer 1997

Report No. FHWA-TS-98-09-02 **June 1998**

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Report No. FHWA-TS-98-09-02

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16 Abstract

This report provides a description of the construction of the SPS-9A experiment, Superpave™ asphalt binder study, field validation of the asphalt specifications and mix design, conducted as part of the Federal Highway Administration (FHWA) Long Term Pavement Performance (LTPP) program in Colchester, Connecticut The overlay construction of six asphalt concrete pavement test sections, three in the East Bound (virgin material) and three on the West Bound (RAP material in the surface layer), started in May 1997 and was completed in September 1997 The construction started in the East Bound followed by the West Bound with milling of the top 50 mm then paving with a 25 mm leveling course. Finally 63 mm of the surface layer was paved in the East Bound lanes first using the CT standard mix with AC-20 for section 01, Superpave™ mix with PG 64-28 for section 02, and Superpave™ alternative mix with PG 64-22 for section 03 The West Bound surface layer was paved last using the same asphalt cement, AC-10 with RAP to end up with AC-20 for section 60, Superpave™ mix with polymer modified PG 58-34 with RAP to end up with PG 64-28 for section 61, and Superpave™ alternative mix with PG 58-28 with RAP to end up with PG 64-22 for section 62, all three designed with 20% RAP material instead of the virgin material used in the East Bound lanes This report contains a description of the milling operation, the paving operations, the equipment used by the contractor, the field sampling and testing operations during and after construction, the laboratory gyratory compacted samples preparation and testing, problems encountered during construction, specific site circumstances, deviations from the standard guidelines, and a summary of the initial data collection

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Construction Report on LTPP 090900, SPS-9A Project, Colchester, CT, Summer of 1997

I. Introduction

This report describes the construction of the SPS-9A Project, Superpave™ (SUperior PERforming asphalt PAVEments) asphalt binder study, at Colchester CT. Superpave™ is a mix design system which incorporates previous experience (Level I) and through use of material test results of both binders and mixes enables the designer to predict the performance of the pavement in terms of occurrence of rutting, fatigue cracking, and low temperature transverse cracking (Levels II and III). Superpave™ was developed by the Strategic Highway Research Program (SHRP). The SPS-9A experiment was developed by the Federal Highway Administration (FHWA) Long Term Pavement Performance (LTPP) Division in cooperation with federal, state, and provincial highway personnel. The experiment design requires a minimum of 3 test sections to be constructed at each location of 32 projects in the experiment, as indicated by the unshaded cells in Table 1, representing specific combinations of average temperatures, temperature extremes, and moisture conditions. Construction can include new construction, reconstruction or overlay. The minimum three test sections should consist of section 01, agency's standard mix, section 02, Superpave™ design mix, and section 03, Superpave™ design mix with alternative binder with a grade either higher or lower than the required Superpave™ binder such that the performance characteristic of interest relative to the climate and pavement structure (either fatigue, low temperature or permanent deformation) may be expected to exhibit deterioration earlier in the service life of the pavement. Since this is a material comparison study, the pavement structure and thickness should be the same for all the test sections. Supplemental sections could be added to investigate additional experimental factors of specific agency interest.

The objectives of the SPS-9A experiment are to observe the performance of Superpave™ mixes as well as comparable agency mixes, and to verify the asphalt binder selection procedure in SHRPBIND, which is a process for determining the environment (high and low temperatures) in which the pavement is constructed and will function. Table 2 lists the projects at five locations in the LTPP North Atlantic (NA) region where the SPS-9A experiment is being implemented, and where the SHRPBIND was used to display the PG asphalt grades from a particular weather station location showing the 50% and 98% reliability based on the temperature records at each site. Table 3 is another listing of these NA projects and the binder selection method used. The agencies' participation in this experiment depends on the availability of equipment to fulfill the performance and volumetric testing requirements as summarized in Table 4.

The Connecticut Department of Transportation (ConnDOT) Project, Figure 1, lies in the wet-freeze environmental area with a poorly graded sand subgrade/embankment material, 250 mm of granular subbase (select borrow), 100 mm of granular Calcium Chloride stabilized base, 150 mm of premixed AC base, 100 mm of AC CT Class 1 binder course, and 50 mm of AC CT Class 114 surface course, Figure 2. The east bound lanes involved building three sections, 090901 CT standard mix with AC-20 asphalt cement, 090902 Superpave™ mix with PG 64-28 asphalt cement, and 090903 Superpave™ alternative mix with PG 64-22 asphalt cement in the surface layer. The west bound lanes involved building three supplemental sections, 090960 CT standard mix with AC-20 asphalt cement, 090961 Superpave™ mix with PG 64-28 asphalt cement, and 090962 Superpave™ alternative mix with PG 64-22 asphalt cement with RAP material in the surface layer.

The project is built on the East Bound and West Bound lanes of Route 2, just 20 kilometers west of the city of Norwich and approximately 45 kilometers east of the city of Hartford, Figure 3 has a site location map showing the FHWA-LTPP CT GPS and SPS test site locations. Route 2 is a four-lane median divided highway, functionally classified as principal arterial. It is also part of the National Highway System (NHS) established as a result of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). The east bound three test sections are constructed adjacent to each other in series starting at the construction chainage of 67+94 east of MP 25.48, and ending at 241+00 west of MP 31.72 (construction stationing is in feet and increasing west to east). The LTPP station 0+00 of the first section 090901 being at construction station 70+44, and the LTPP station 5+00 of the last section 090903 being at construction station 238+50, Figure 4 and Table 5. The west bound three test sections are constructed adjacent to each other in series starting at the construction chainage of 89+90 and ending at 238+74 (construction stationing is in feet and increasing west to east). The LTPP station 0+00 of the first section 090960 being at construction station 92+40 west of MP 31.72, and the LTPP station 5+00 of the last section 090962 being at construction station 236+24 east of MP 25.48, Figure 4 and Table 5. Each monitoring section is 152.4 meters long and 3.7 meters wide. The East Bound and West Bound outer shoulders, adjacent to the test sections, are paved 3.7 meter wide shoulders. The inner shoulders of Route 2 are constructed with a paved width of 0.9 m. Truck climbing lanes existed throughout the westbound direction and for the final 4 km of the eastbound direction. However all existing truck climbing lanes were eliminated during this construction project.

The project was built as part of the Connecticut Department of Transportation. Project No. 28-185 "Resurfacing, Bridge and Safety Improvements on Connecticut Route 2 in Various Towns" which begins in Colchester and runs easterly for a distance of 10 km through Lebanon and Bozrah towns. The project was advertised for bids in early summer 1996 using ConnDOT standard contract administration and construction procedures. The contract was awarded to Soneco/Northeastern, Inc. of Groton, CT on November 5, 1996 for the value of US$ 3,137,961.60. The "Notice to Proceed" was issued on December 2, 1996 with 184 calendar days for the completion of the project.

A meeting was held at the CT Department of Transportation in Rocky Hill on July 18, 1995 to discuss and plan the construction of the SPS-9 A experiment. Of particular focus in this meeting was the site layout. binder selection and specification, testing and sampling plans, sites instrumentation, and materials specifications. The meeting was attended by ConnDOT Maintenance and Research and Materials and by the LTPP North Atlantic Regional Office (NARO). A pre-construction planning meeting was held at the same location on November 4, 1996 to review and discuss in detail questions and concerns that the ConnDOT staff had regarding the construction, planning, sampling, testing, and monitoring of the SPS-9A experiment. Also discussed in the meeting were the project special provisions, the QC/QA plan, and the LTPP laboratory testing protocols. The meeting was attended by ConnDOT Research and Materials, FHWA CT Division, University of Connecticut, and LTPP NARO. The staff from ConnDOT Research and Materials and from LTPP NARO resumed the meeting on the afternoon of the same day and the following day to complete the review of the testing and sampling plan and to further discuss the LTPP laboratory test protocols.

A Pre-construction Conference was held at the ConnDOT District II Headquarters in Norwich, CT on November 20, 1996 to discuss the details of the project. The meeting was chaired by Mr. Charles Panteleakos, ConnDOT Assistant District Engineer and was attended by the contractor staff and by ConnDOT Construction, Maintenance, Traffic, Pavement Management, Planning, Research and Materials, and by the LTPP NARO representative. Another meeting was held on December 3, 1996 at the University of Connecticut to discuss the mix design and binder grade selection, especially for the RAP paving. In attendance were the University of Connecticut Advanced Pavement Laboratory (CAP Lab) staff, who were responsible for the pavement design, the contractor Soneco/Northeastern, the binder supplier Hudson Co., the ConnDOT Research and Materials staff, and the LTPP NARO representative. One more meeting was held at the District II Headquarters on December 12, 1996 to finalize issues of concern to the contractor mainly the QC/QA procedures, test strips, percentage of RAP in west bound lanes, and other issues. The meeting was attended by Soneco/Northeastern, CAP Lab, ConnDOT Construction and ConnDOT Research and Materials.

On site and in charge of the construction work was Mr. Paul Andruskiewicz, ConnDOT project engineer and Mr. Christopher Firby ConnDOT project inspector. From the ConnDOT Research were Mr. Donald Larsen, Mr. John Henault, and Mr. Jeff Scully and from the ConnDOT Materials and Laboratory, who handled all the material sampling on site as well as the gyratory compaction and the laboratory testing required, were Mr. Nelio Rodrigues and Mr. Raffaele Donato. All the lab testing of the field samples and the gyratory compaction were performed by the state personnel at the contractor's laboratory at the Asphalt Plant in Montville, CT. Testing of the constituent materials and of the laboratory mixed loose and gyratory compacted samples and on cores were performed at the ConnDOT Materials Testing Laboratory in Rocky Hill CT (LTPP Laboratory Assigned Code 0921). Additional testing will be performed by the FHWA Contractor Laboratory, Braun Intertec in Minneapolis MN (LTPP Laboratory Assigned Code 2711), and the Superpave Regional Test Center, pending finalizing the level III testing to be performed on gyratory samples and cores from the Superpave™ test sections.

Soneco Northeastern Inc. used asphalt from their batch asphalt plant in Montville, CT. The hauling distance between the SPS-9A sites and the plant is 18-22 kms and takes 30-50 minutes travel time. This four ton, five cold bin, four hot bin batch mix asphalt plant was manufactured by Cedar Rapids model number H60B. The contractor provided the aggregates and Hudson Oil Co. of Providence RI provided all the asphalt cement except for the PG 58-34, used in section 090961, which was supplied by Petro Canada in Montreal, Province of Quebec, Canada. The AC cement used in the AC surface layer was PG 64-28 for the Superpave™ section 02, and PG 64-22 for the Superpave™ alternative section 03 and AC-20 for the CT agency section 01. On the RAP sections in the west bound lanes, the AC cement used in the AC surface layer was PG 58-34, which when mixed with 20% of the RAP ends up with PG 64-28 for the Superpave™ section 61, and PG 58-28, which when mixed with 20% of the RAP ends up with PG 64-22 for the Superpave™ alternate section 62, and AC-10, which when mixed with 20% of the RAP ends up with AC-20 for the CT agency section 60. For the AC leveling layer CT Class 2 mix with AC-20 asphalt cement was used for all the sections in the East Bound virgin sections and the West Bound RAP sections. All mix designs used in this project are included in Appendix A. Photos of the asphalt plant taken on July 15, 1997 are included in Appendix B.

The paver used on site was a Blaw-Knox model PF-180H which was used to pave widths ranging from 3.7 to 4.5 meters. Four rollers were used on site for compaction, the main breakdown roller was a Double Drum Vibratory Hyster Roller model C766A, 10.9 tons gross weight, also a Caterpillar Double Drum Vibratory Roller model CB-354, 10.1 tons gross weight was used once, on the surface layer of section 090903, as the breakdown roller but mainly as the final Roller on the leveling course. An intermediate roller was used only once in this project, which was a Caterpillar Double Drum Vibratory Roller model CB-614, 12.0 tons gross weight, used on the surface layer of section 090961. The main final roller was a Steel Wheel Tandem Hyster Roller model C350C, 14.2 tons gross weight, which was used on the surface layer of all the sections and on the leveling layers of sections 090960 and 090961. The milling equipment used on site was a CMI model PR-800-7 Rotomiller with a cutting head width of 2.2 meters.

II. Project Details

East Bound Virgin Overlay Construction Layout

The three main LTPP SPS-9A virgin sections are laid in series starting with section 090901, Standard ConnDOT Class 1 mix design with AC-20 asphalt cement, with its beginning station 0+00 at construction station 70+44 followed by section 090902, Superpave™ design with PG 64-28 asphalt cement, with its beginning station 0+00 at construction station 175+93 and finally section 090903, Superpave™ alternative design with PG 64-22 asphalt cement, with its beginning station 0+00 at construction station 233+50 and its last station 5+00 at construction station 238+50, all construction stations are in feet and increasing west to east, Figure 4 and Table 5. The two sampling areas before and after each section, each 76.2 meters long, were paved with the same design to be used for coring at six intervals, the first interval is A at 0 months right after paving and the next is B at 6 months, C at 12 months, D at 18 months, E at 24 months, and finally F at 48 months.

West Bound RAP Overlay Construction Layout

The three ConnDOT supplemental RAP sections are laid in series starting with section 090960, Standard ConnDOT Class 1 mix design with AC-20 asphalt cement (AC-10 and 20% RAP), with its beginning station 0+00 at construction station 92+40 followed by section 090961, Superpave™ design with PG 64-28 asphalt cement (PG 58-34 and 20% RAP), with its beginning station 0+00 at construction station 170+88 and finally section 090962, Superpave™ alternative design with PG 64-22 asphalt cement (PG 58-28 and 20% RAP), with its beginning station 0+00 at construction station 231+24 and its last station 5+00 at construction station 236+24, all construction stations are in feet and increase from east to west, Figure 4 and Table 5. The two sampling areas before and after each section, each 76.2 meters long, were paved with the same design to be used for coring at six intervals, the first interval is A at 0 months right after paving and the next is B at 6 months, C at 12 months, D at 18 months, E at 24 months, and finally F at 48 months.

Field Materials Sampling and Testing

Locations for field material sampling and testing are summarized in Figures 5 through 7 for the east bound, and Figures 8 through 10 for the west bound. Seven stages of field material sampling and testing are required here; first, before construction or paving, on the existing pavement. This stage involves pushing auger probes in the shoulder to 6 m below the surface to check the depth to rigid layer and coring 305 mm cores, which are examined for stripping, and the core holes are used for collecting bulk and moisture samples from the unbound base, subbase, and subgrade layers. The second stage of sampling and testing, performed during construction or paving, involves measuring the density, using the nuclear gauge, of the AC leveling and surface layers and collecting hot mix samples of the surface layer and constituent aggregate and asphalt cement for laboratory testing and preparing lab mixed gyratory samples. Also this stage involves collecting combined aggregate sample and asphalt cement to be sent to the LTPP Materials Reference Library (MRL) for storage. The first interval of coring right after construction, referred to as interval A at time = 0 months, is also part of the second stage of sampling. The third to seventh stages of sampling only require collecting 152 mm cores, from the sampling areas before and after each of the sections. These are performed at specific intervals starting at interval B at time = 6 months, then interval C at time = 12 months, then interval D at time = 18 months, then interval E at time = 24 months, and finally interval F at time = 48 months. The field testing is summarized in Table 6 and the material sampling is summarized in Table 7, while Table 8 lists the asphalt, aggregate, and mix bulk sampling performed during construction for laboratory testing and for shipping to MRL.

The sampling of the hot mix in the field from the paver and the subsequent handling and preparation of gyratory compacted specimens at the required compaction temperature can pose problems. There is a need for consistency in the temperature regime experienced by the mix until compaction, particularly for the 28 Gyratory Compacted Specimens (GCS), collected from the Superpave™ section 02, which are intended for performance testing. The six Quality Control samples, each of about 6 to 6.5 kilograms, should be immediately placed into an insulated container and delivered to the laboratory for GCS compaction.

Laboratory Materials Testing

The laboratory material testing plan for each of the subsurface unbound layers and the combined aggregate and asphalt cement is summarized in Table 9 The LTPP test designation and Protocol number for each test are listed and so are the number of tests per layer and material source or test or sample location. For the AC surface layer, three main sets of samples are prepared and tested so that the aging characteristics of the binder and mix can be assessed. The constituent aggregate and asphalt cement are used to prepare a lab mixed lab compacted set for comparison with the plant mixed lab compacted set and the plant mixed field compacted set (cores). The gyratory compactor is used for preparing the lab and field specimens using AASHTO TP4 procedure. Three gyration levels are of interest, N_{ini} (initial number of gyrations), N_{des} (design number of gyrations), and N_{max} (maximum number of gyrations). The range of values for N_{ini}, N_{des}, and N_{max} is shown in Table 10A which are based on the appropriate traffic loading and environmental conditions. The actual values for N_{ini}, N_{des}, and N_{max} for the NA region SPS-9A projects, including the CT sites, are listed in Table 10B.

For sections 01, 03, 60, 61, and 62, 9 lab mixed lab compacted gyratory specimens are required from each test section, 3 of which to be compacted at N_{max} and 6 at 7% air voids. From the same sections, 6 plant mixed lab gyratory compacted specimens are required at N_{max}. Also 1 lab mixed loose AC sample is kept for maximum specific gravity determination, and 2 plant mixed loose AC samples are collected for maximum specific gravity determination and extraction to determine the asphalt content and the extracted aggregate gradation. The laboratory tests, LTPP test designation, LTPP protocol, number of tests per section, and the source of material or specimen are listed in Table 11.

For the Superpave™ section 02, 40 lab mixed lab compacted gyratory specimens are required, 6 of which to be compacted at N_{max}, 2 at 3% air voids , and 32 at 7% air voids. From the same section, 34 plant mixed lab gyratory compacted specimens are required, 6 to be compacted at N_{max}, 2 at 3% air voids, and 26 at 7% air voids. Also 1 lab mixed loose AC sample is kept for maximum specific gravity determination, and 3 plant mixed loose AC samples are collected for maximum specific gravity determination and extraction to determine the asphalt content and the extracted aggregate gradation The laboratory tests, LTPP test designation, LTPP protocol, number of tests per section, and the source of material or specimen are listed in Table 12.

The laboratory testing on the cores for all the sections and all the intervals are listed in Table 13. From each section at each interval 8, 152 mm diameter, cores are tested except for the Superpave™ section 02 at interval A, from which 34 cores were needed but only 18 were collected since the Superpave™ laboratory testing by the Superpave Regional Testing Center has not been finalized yet.

In addition to the ConnDOT Materials Testing Laboratory in Rocky Hill CT (LTPP Laboratory Assigned Code 0921), some of the testing, especially the Resilient Modulus, Tensile Strength, and Creep Compliance will be performed by the FHWA-LTPP Contractor Laboratory, Braun Intertec in Minneapolis, MN (LTPP Laboratory Assigned Code 2711) and the Superpave Regional Test Center, the latter pending finalizing the level III testing to be performed on the gyratory samples and cores from the Superpave™ test section. Table 14 lists the lab, field, and core samples from the project and the laboratory assigned for testing each sample.

Table 15 lists the dates of all the field testing and sampling activities before, during, and after construction at various periods. Table 16 lists the actual dates as compared to the guidelines for the initial monitoring activities performed after construction of the SPS-9A sites. Figure 11 is a schematic diagram of the sections with the paving information.

III. Pre Construction Operations and Performance

Pre construction testing and sampling was done on September 9, 10, and 11, 1996. Table 6 lists all the field testing, number of tests, and location designation which are performed on site before construction and Table 7 lists the material sampling of the different subsurface layers, number of samples, and sample numbers which were collected from the site. Table 9 lists the laboratory testing to be performed on the collected samples by the ConnDOT laboratory.

The site was initially marked during the second week of April 1997 following the guidelines for marking LTPP SPS sections. Figures 12 and 13 show the paint marks used on the sections to identify the location of the beginning of each of the sections and at 30.5 m intervals.

Profilometer™ testing was initially performed on April 9, 1997. The International Roughness Index (IRI) values of five runs and the average at the left, right, and both wheel paths for each of the six sections, before and after construction, are presented in Table 17and in a spreadsheet in Appendix A. Plots of the elevation measurements, in the left wheel path and the right wheel path, from all the sites, before and after construction, are presented in Figures 14 to 19. The site was also videoed on April 9, 1997.

The Falling Weight Deflectometer (FWD) and Manual Distress Survey (MDS), including transverse Dipstick™ measurements, on the existing surface layer of the sections were performed on April 8 and 9, 1997. The MDS indicated that there were moderate severity and few low severity longitudinal and transverse cracks in all the sections. Also some low and moderate fatigue cracking and patching were observed in sections 03, 61, and 62. Low and moderate bleeding and raveling were also picked up in all the sections, Table 18. The rut depth values in the left and right wheel paths, as determined from the Dipstick™, before and after construction, are summarized in Table 19 and plotted in Figures 20 to 25. The FWD results are presented in a spreadsheet in Appendix A.

IV. Construction

Table 20 lists all the dates of the construction activities for all the sections. The milling operation started on the west bound lanes with section 090960 on May 1, 1997 followed by section 090961 on May 16, 1997. The operation was then shifted to the east bound lanes starting with section 090901 on May 29, 1997 then section 090902 on June 3 and 090903 on June 4, after which the milling on the west bound was resumed to finish the last section 090962 on June 9, 1997. The paving of the leveling course was performed in the same manner starting on the west bound lanes with section 090960 on May 21 then 090961 on May 22, after which the paving was shifted to the east bound lanes starting with section 090901 on June 3 followed by 090902 on June 5 and 090903 on June 6, after which the paving on the west bound was resumed to finish the last section 090962 on June 10, 1997. The paving of the surface layer started on the east bound lanes on June 23, 1997 with section 090901 followed by 090903 on June 28 and 090902 on July 15, 1997. The surface paving of the west bound lanes started on August 7 with section 090960 followed by 090962 on August 12 and finally the paving on the SPS-9A sections was completed on September 8, 1997 by the paving of the Superpave™ RAP section 090961. Table 21 lists the dates, times, layer paved, thickness, number of times and value of the laydown temperature, air temperature, and weather condition during paving. Figure 11 also shows the surface layer paving dates, times, and sample locations.

Nuclear gauge densities were measured on the leveling and surface AC layers, the values are listed in Table 22. Cores drilled from the sampling areas of each of the six sections at two intervals, interval A (time = 0 months) and interval B (time = 6 months) are recorded in Table 23. This table lists the thickness of the surface layer of each of the cores for comparison with the design thickness of 63 mm and the deviation from the construction guidelines which require that the thickness be within 10 mm of design. Table 24 is a summary of the thickness measurements from the cores at the two intervals and how much deviation from the design thickness exist.

The construction guidelines require the use of the rod and level survey for taking elevation readings at a minimum of five locations (edge, outer wheel path, midlane, inner wheel path, and inside edge of pavement) at longitudinal intervals no greater than 15.2 meters. This condition is to ensure the conformity of the different layers to the design thickness and for comparison with other projects at varying locations. This requirement was not met and only the thickness from the cores before and after the monitoring sections are available for this experiment.

Surface Condition and Preparation - Milling

There was no surface preparation performed on any of the sections before the milling operation. Crack sealing was performed on these sections in September and October of 1994. Manual Distress Survey (MDS) was performed on April 8 and 9, 1997 to identify the surface condition before milling and paving, Table 18. The MDS indicated that there were moderate severity and few low severity longitudinal and transverse cracks in all the sections. Also some low and moderate fatigue cracking and patching were observed in sections 03, 61, and 62. Low and moderate bleeding and raveling were also picked up in all the sections.

As the milling operation was starting on the main line road, raised pavement markers were discovered under the existing CT Class 114 surface layer. To ensure no damage was done to the milling machine, it was decided to remove the buried raised pavement markers, approximately 2000 of which were located by ConnDOT using a metal detector. The contractor removed these markers using jackhammers.

The milling was performed by a subcontractor who used a ROTO-MILL Pavement Profiler model type PR-800-7 manufactured by CMI Corporation, Oklahoma City. The milling operation started on the morning of May 1, 1997 with section 090960 and finished with section 090962 on June 9, 1997. Approximately 900-1200 m per day were milled in six passes, each pass was 2.2 m wide, with a 75 mm overlap of adjacent passes. The design called for removal of 51 mm of the existing pavement surface layer, which was all of the CT Class 114 mix. The actual milling depth in the SPS-9A sections varied between 58 and 69 mm, Table 25. A Manual Distress Survey MDS after milling indicated that there were still very few low severity longitudinal cracks in sections 01, 02, and 03. Also some low severity transverse cracks were noticed in all the sections while moderate severity transverse cracking and low severity pot holes were picked up in sections 01 and 60. Finally some low severity patching were observed in sections 01, 03, 60, 61, and 62, Table 18.

The original contract required that the milled surface be open to traffic no longer than 48 hours after paving with the leveling course. This condition was not fulfilled and the state relieved the contractor of the 48 hour requirement. Most of the sections were opened to traffic within a week of milling except for section 090960 which took 3 weeks, Table 25.

AC Dense Graded Leveling Layer Paving - Virgin Material

The leveling layer paving on the SPS-9A sections started on May 21, 1997 in section 090960 and was completed on June 10, 1997 with section 090962. A tack coat of SS1 emulsion was applied, at the rate of 0.09 to 0.18 liters per square meter, on the milled surface prior to paving the leveling course. A standard ConnDOT Class 2 mix, with AC-20 asphalt cement, was used on all six sections (Job Mix Formula in Appendix A). The design thickness is 25 mm but, because this is a leveling course, the actual final thickness varied between 25 and 50 mm. Table 21 lists the paving dates, laydown temperatures and the weather condition during paving. The guidelines of the SPS-9A experiment do not require sampling and testing of the leveling layer as is required of the surface layer. Three nuclear gauge density measurements were performed on the leveling layer of all the sections at 0.9 m offset from the edge of pavement, at station 30 m (1+00), 76 m (2+50), and 122 m (4+00), Figures 5-10. The results from these measurements are listed in Table 22.

AC Dense Graded Surface Layer Paving, EB Virgin and WB RAP Material

Surface layer overlay paving on the east bound lanes of the three main experiment SPS-9A sections with virgin material started on June 23, 1997 in section 090901 and was completed on July 15, 1997 with section 090902. The three SPS-9A supplemental sections in the west bound lanes with RAP material were paved starting with section 090960 on August 7, 1997 and completed on September 8, 1997 with the paving of section 090961. The SPS-9A guidelines require the construction of a minimum three sections that include a design based upon the highway agency's standard hot mix asphalt (HMA) mixture design, Superpave™, and using a Superpave™ mixture with a SHRP binder grade either higher or lower than required by the Superpave™ design method. A standard ConnDOT Class 1 mix, with AC-20 asphalt cement, was used in section 090901, a Superpave™ mix with PG 64-28 asphalt cement was used in section 090902, and a Superpave™ alternative mix with PG 64-22 asphalt cement was used in section 090903. On the RAP supplemental sections in the west bound lanes, a standard ConnDOT Class 1 mix with AC-10, which when mixed with 20% of the RAP ends up with AC-20 was used in section 090960, a Superpave™ mix with PG 58-34, which when mixed with 20% of the RAP ends up with PG 64-28, was used in section 090961, and a Superpave™ alternative mix with PG 58-28, which when mixed with 20% of the RAP ends up with PG 64-22, was used in section 090962 (Job Mix Formulas in Appendix A). Table 21 lists the paving dates, laydown temperatures and the weather condition during paving.

Test strips for each of the sections were placed and approved before paving was allowed to continue. These test strips (91 m x 3.7 m) were used to establish a rolling pattern and were approved only if all specifications for gradation, binder percent, air voids, VMA, VFA, and field density were met. An anti stripping agent, called Kling Beta, was used for the Superpave™ mixes at a rate of 0.25 percent by weight of the binder.

Bulk samples of the surface layer include hot mix field samples and constituent materials for quality control tests, Superpave™ materials and mixture tests, binder characterization, and shipment to the MRL for future tests. For the purpose of binder and mix characterization tests, the SPS-9A experiments are classified into Main Study and Level III study. The amount of Superpave™ level III performance tests defines the difference between the Main Study and Level III study projects, Table 4. From each of sections 090901, 090903, 090960, 090961, and 090962 9 laboratory mixed samples and 6 plant mixed samples are required to prepare gyratory compacted specimens for testing by the ConnDOT lab as indicated in Table 11. One loose lab mixed sample and two loose plant mix samples are also required for completion of the tests needed. For the Superpave™ section 090902, 40 laboratory mixed samples and 34 plant mixed samples are required to prepare gyratory compacted specimens for testing by the ConnDOT lab, the LTPP contractor lab Braun Intertec in Minneapolis MN (LTPP Performance Tests), and for storage at the MRL for future testing by the Superpave Regional Testing Center, as indicated in Table 12. One loose lab mixed sample and three loose plant mix samples are also required for completion of the tests needed. The ConnDOT Field Samples Results of Quality Control Related Testing performed on the six gyratory and loose samples of all the sections are summarized in Table 26.

Three nuclear gauge density measurements were performed on the surface layer of all the sections at 0.9 m offset from the edge of pavement, at station 30 m (1+00), 76 m (2+50), and 122 m (4+00), Figures 5-10. The results from these measurements are listed in Table 22.

Coring of the AC surface and leveling layers was performed at two intervals, the first at interval A, 0 months after construction, this was conducted on September 15 and 16, 1997 and the second at interval B, 6 months after construction, this was conducted on April 1 and 2, 1997. The results in Table 23 indicate no thickness values outside the limits specified in the construction guidelines, mainly $\pm$ 10 mm for AC surface layer, for interval A and only 3 out of 8 cores collected at interval B in section 090901 were below the allowable limit. Also in the construction guidelines it is stated that "the as-compacted thickness of the asphalt concrete layer (surface plus binder course) in any test section shall be constructed to within $\pm$ 6 mm of the average value of the other test sections in the project". Some deviations to this part of the guidelines was noticed.

The thickness from the cores are not as accurate as the thickness from the rod and level for two reasons, first these cores are taken from the sampling areas before (station 0-) and after (station 5+) each section, second the measurements are done on site with a regular measuring tape or ruler. Table 24 displays the thickness as determined from the cores for the combined leveling and surface layers as well as only the surface layer thickness and how much the surface differs from the design. Also indicated are the average combined thickness of every five sections and how that thickness compares to the value of the sixth section. At interval A the cores from sections 090902, 090961, and 090962 did not meet this requirement and had 7-9 mm difference from the average of the other sections. At interval B the cores from sections 090901 and 090902 did not comply and had a difference of 11 mm and 15 mm respectively from the average of the other sections. This is not critical since the leveling course is meant to have a variable thickness depending on the site conditions before paving with the surface layer, which is meant to be as close as possible to the design.

Asphalt Cement and Aggregate Sampling

The asphalt plant was visited six times between June 23 and September 8, 1997 and pictures were taken throughout the plant site, Photos in Appendix B. Three sets of samples were taken of the six PG grade asphalt cement (AC-20, PG 64-28, PG 64-22, AC-10, PG 58-34, and PG 58-28) and the four combined aggregate types used (CT Class 1 standard mix, same with 20% RAP, Superpave™ mix, and same with 20% RAP). The first set of samples was collected and sent to the MRL for storage, Table 8B. The second set of samples was collected for the ConnDOT lab to be used in the SPS-9A laboratory testing of the constituent materials as described in Table 9. While the third set of samples was collected also for the ConnDOT lab for preparing the laboratory mixed samples that will be used to prepare the lab gyratory specimens for testing as listed in Tables 11 and 12. Table 7 lists all the asphalt and aggregate bulk sampling performed during construction and Table 8 separates the part to be used for testing as part of the SPS-9A experiment and the part for shipping to the MRL facility in Reno, Nevada.

Deviations from the Construction Guidelines

When the bulk hot mix quality control samples were collected they were placed in insulated containers and moved to the lab for compaction prior to significant loss of heat. ConnDOT staff used the contractor lab at the asphalt plant which is located in Montville, approximately 20 kms away from the site and the journey takes around 45 minutes. The sampling and testing guidelines state that if the samples are within 5°C of the compaction temperature, no reheating of the asphalt mix is required prior to compaction. Otherwise the asphalt mix shall be reheated to compaction temperature. In no event should reheating time be greater than 30 minutes, as longer heating times may change the physical and chemical properties of the asphalt binder. All the samples were reheated to more than 30 minutes before preparing the GCS, some of the data is presented in Table 26.

The SPS-9A construction guidelines require consistency in layer thickness for each site. The thickness of the surface layer should not deviate more than 10 mm from design. Also in the construction guidelines it is stated that "the as-compacted thickness of the asphalt concrete layer (surface plus binder course) in any test section shall be constructed to within $\pm$ 6 mm of the average value of the other test sections in the project". This could not be verified accurately since no rod and level elevation measurements were taken throughout the construction of this project.

The construction guidelines state that the finished surface of the overlay should be smooth and provide an excellent ride level. As a target, the as-constructed surface should have a pro-rated profile index of less than 160-mm per km as measured by a California type Profilograph and evaluated following California Test 526. No such test was performed on the project and only the ConnDOT ARAN and the LTPP Profilometer™ were used to measure the profile, the results are displayed in Table 17.

Also according to the Guidelines, deflection and profile survey measurements were supposed to be performed, 1-3 months and less than two months respectively, after the construction is completed. The deflection survey on the east bound was delayed two weeks and the profile survey on the east bound was delayed six weeks due to the fact that the construction on the west bound lanes finished close to two months after the east bound lanes.

V. Post Construction Operations and Initial Performance

All the sections were marked on September 15, 16, and 17, 1997 as required in the guidelines. Figure 12 and 13 show the paint marks used on the sections to identify the location of the beginning of each of the sections and at 30.5 m intervals.

Profilometer™ testing was performed on October 28, 1997. The International Roughness Index (IRI) values of five runs and the average at the left, right, and both wheel paths for each of the six sections, before and after construction, are presented in Table 17 and in a spreadsheet in Appendix A. Plots of the elevation measurements, in the left wheel path and the right wheel path, from all the sites are presented in Figures 14 to 19. The site was also videoed on October 28, 1997.

The Falling Weight Deflectometer FWD and the Manual Distress Survey MDS, including transverse Dipstick™ measurements, were performed on October 28, 29, and 30, 1997. The FWD and MDS results are presented in a spreadsheet in Appendix A and in Table 18 respectively, while the rut depth values in the left and right wheel paths, as determined from the Dipstick™ are summarized in Table 19 and plotted in Figures 20 to 25.

During the initial monitoring period, September 1997 to April 1998, the site was reported as having no obvious distresses, Table 18.

Two Weight-In-Motion (WIM) stations were installed on the project. One in the east bound lanes and one in the west bound lanes.

The lanes were opened to traffic on the same day after paving, testing, and lane markings were completed.

Table 1. Experimental Design for SPS-9A Experiments

Moisture		Wet > 635 mm/year of precipitation				Dry < 635 mm/year of precipitation			
Average 7 Day Maximum Pavement Design Temperature		<52C	<58C	<64C	<70C	<52C	<58C	<64C	<70C
Minimum Pavement Design Temperature	>-46C								
	>-40C								
	>-34C								
	>-28C								
	>-22C								
	>-16C								
	>-10C								

Notes: Traffic rate should exceed 50,000 ESAL/year in study lane.
Total traffic for design (design life) is Agency choice.
The average 7-day maximum pavement design temperature is the average of the highest daily pavement temperatures for the seven hottest consecutive days.
The minimum pavement design temperature is the coldest pavement temperature of the year.

Table 2. PG Asphalt Binders in SPS-9A Projects in the NA Region

Moisture		Wet > 635 mm/year of precipitation				
Average 7 Day Maximum Pavement Design Temperature		<52C	<58C	<64C	<70C	<76C
Minimum Pavement Design Temperature	>-46C	98%QE	98%ON			
	>-40C	**02-QE** 50%QE 50%ON	**02-ON**			
	>-34C	03-QE	03-ON			
	>-28C	03-NJ	**02-NJ** 98%NJ 98%CT	**02-CT**		61-NJ
	>-22C	50%CT	50%NJ	**02-NC** 03-CT 98%NC	03-NC	60-NC
	>-16C		50%NC			
	>-10C					

Notes. Traffic rate should exceed 50,000 ESAL/year in study lane

Total traffic for design (design life) is Agency choice

The average 7-day maximum pavement design temperature is the average of the highest daily pavement temperatures for the seven hottest consecutive days.

The minimum pavement design temperature is the coldest pavement temperature of the year

02-CT· Used in Superpave™ section 02.

03-CT· Used in Alternative Superpave™ section 03

98%CT: SHRPBIND PG Asphalt 98% Reliability.

50%CT SHRPBIND PG Asphalt 50% Reliability.

Table 3. Binder Selection for SPS-9A Experiments in the NA Region

Agency / SPS-9A ID	Weather Station Location	Lat. N / Long. W	SHRPBIND PG Asphalt 98% Reliab. / 50% Reliab.	PG Binder in Superpave™ Section 02	Binder in Agency Section 01	PG Binder in Alternative Superpave™ Section 03	Other Binders in Experiment
Connecticut / 090900	Colchester	41.55 / 72.37	58-28 / 52-22	PG 64-28	AC 20	PG 64-22	Same 3 with RAP
New Jersey / 340900	Highstown	40.27 / 74.57	58-28 / 58-22	PG 58-28	AC 20	PG 52-28	PG 64-22 PG 76-28P AC 20 RAP
North Carolina / 370900	Moncure	35.58 / 79.05	64-22 / 58-16	PG 64-22	AC 20	PG 70-22	PG 76-22MG PG 76-22SMA PG 76-22SBR AC 20 PG 76-22SBS PG 70-22
Ontario / 870900	Petawawa	45.95 / 77.32	58-46 / 52-40	PG 58-40	85/100 Pen. Gr	PG 58-34	PG 58-28 PG 58-34P PG 58-40M
Quebec / 890900 89A900	Shipshaw	48.45 / 71.22	52-46 / 52-40	PG 52-40	PG 52-34	PG 52-34	

Notes: P Polymer Modified
M Marshal Design
RAP Recycled Asphalt Pavement
MG Superpave design with Multigrade PG 76-22
SMA SMA Mix with contractor choice of PG 76-22
SBR Superpave design with SBR modified PG 76-22
SBS Superpave design with SBS modified PG 76-22

Table 4. Summary of SPS-9A Testing

Project Type	Test Section	Time After Construction, months					
		0	6	12	18	24	48
Main Study	Agency	V	V	V	V	V	V
	LTPP Binder	S*	V	V	V	V	V
	Alternate LTPP Binder	V	V	V	V	V	V
Superpave™ Level III Sites	Agency	S		S		S	S
	LTPP Binder	S*		S		S	S
	Alternate LTPP Binder	S		S		S	S

Notes: Testing Types: V = volumetric and binder stiffness tests
S = Superpave™ Level III performance tests

S* - Superpave™ Level III testing at t=0 months will be performed on 3 sets of specimens, design mixture in the laboratory, plant mixture compacted in the laboratory, plant mixture compacted in the field (cores)

Table 5. Site Layout, SPS-9A Project 090900 on East Bound and West Bound Route 2

Construction Stations	Experiment Stations	Length (m)	New Construction AC Thickness mm	Old Construction AC and Base/Subbase Thickness mm	Remarks	Section ID
East Bound Overlay Construction Virgin Materials						
70+44 - 75+44	0+00 - 5+00	152 4	63 Top 25 Leveling	100 Binder 150 AC Base 100 GB 250 SB	Fill	**090901**
175+93 - 180+93	0+00 - 5+00	152 4	63 Top 25 Leveling	100 Binder 150 AC Base 100 GB 250 SB	Fill	**090902**
233+50 - 238+50	0+00 - 5+00	152.4	63 Top 25 Leveling	100 Binder 150 AC Base 100 GB 250 SB	Fill	**090903**
West Bound Overlay Construction RAP Materials						
92+40 - 97+40	0+00 - 5+00	152 4	63 Top 25 Leveling	100 Binder 150 AC Base 100 GB 250 SB	Cut & Fill 0+00 - 1+00 Fill 1+00 - 4+00 Cut 4+00 - 5+00 Fill	**090960**
170+88 - 175+88	0+00 - 5+00	152 4	63 Top 25 Leveling	100 Binder 150 AC Base 100 GB 250 SB	Fill	**090961**
231+24 - 236+24	0+00 - 5+00	152 4	63 Top 25 Leveling	100 Binder 150 AC Base 100 GB 250 SB	Fill	**090962**

Notes
Top -AC Dense Graded Asphalt Concrete Surface Layer
Leveling -AC Dense Graded Asphalt Concrete Class 2 Leveling Layer
Binder -AC Dense Graded Asphalt Concrete Class 1 Binder Layer
AC Base -AC Dense Graded Asphalt Treated Premixed Base Layer
GB -Granular Calcium Chloride Stabilized Base Layer
SB -Granular Subbase Layer

Table 6. Scope of Field Testing

Layer	Test	Number of Tests / section	Location Designation
Pre Construction			
Depth to Rigid Layer	Shoulder Auger Probes to 6 m or refusal	1	S01AXX*
Field Examination of Cores for Stripping	LTPP	1	Station 0-25, 0.9 m offset, 305 mm cores for access to underlying layers
During Construction **Asphalt Conc. Leveling** In-Situ Density (Nuclear Gauge) Leveling Course	AASHTO T238-86 (backscatter)	3	T01AXX* - T03AXX* Station 1+00,2+50,4+00, 0.9 m from pavement edge
During Construction **Asphalt Concrete Surface** In-Situ Density (Nuclear Gauge) Surface Course	AASHTO T238-86 (backscatter)	3	T04AXX* - T06AXX* Station 1+00,2+50,4+00, 0.9 m from pavement edge

Note: * XX last two digits of location identifiers is the section number (01, 02, 03, 60, 61, and 62)
Stations are in feet

Table 7. Scope of Material Sampling

Pre Construction

Layer	Section ID	Number of Samples / Section	Sample Number
Subgrade Bulk Sampling (10 kg per sample) + Moisture Content Samples	0909XX	2 + 2	BS01AXX,BS02AXX + MS01AXX,MS02AXX
Unbound Subbase Bulk Sampling (25 kg per sample) + Moisture Content Samples	0909XX	2 + 2	BG03AXX,BG04AXX + MG03AXX,MG04AXX
Unbound Base Bulk Sampling (25 kg per sample) + Moisture Content Samples	0909XX	2 + 2	BG01AXX,BG02AXX + MG01AXX,MG02AXX

XX Section Numbers 01, 02, 03, 60, 61, and 62

During Construction

Layer	Section ID	Number of Samples / Section	Sample Number
Asphalt Concrete (Surface Layer) Bulk Sampling - 6/34*split off samples (to prepare plant mix gyratory samples)	0909XX	6/34*	BA01AXX-BA06AXX
Constituent Aggregate Bulk Sampling (for MRL, for laboratory testing, and to prepare lab mix gyratory samples)	0909XX	1	BU01AXX
Asphalt Cement Bulk Sampling (for MRL, for laboratory testing, and to prepare lab mix gyratory samples)	0909XX	1	BC01AXX

XX Section Numbers 01, 02, 03, 60, 61, and 62

* Six from each section except section 090902 where 34 samples are collected

Post Construction

Layer	Section ID	Number of Samples / Section	Sample Number
Asphalt Concrete (Surface Layer) Interval A Coring (0 months) 152 mm coring	0909XX	8/34*	CA01AXX- CA08/34AXX*
Interval B-F Coring (6-48 months) 152 mm coring	0909XX	8 X 5 intervals	CA01BXX-CA08FXX

XX Section Numbers 01, 02, 03, 60, 61, and 62

* Eight from each section except section 090902 where 34 cores are needed, but only 18 are collected at this stage while the 16, intended for the Superpave Regional Test Centre, are postponed to a later stage.

Table 8. Asphalt and Aggregate Bulk Material Sampling During Construction

A. Materials for Testing as Part of the SPS-9A Experiment

Material Description	Number of Samples	Quantity of Each Sample	Sample Location
Asphalt Cement Bulk Sampling	1 for each type of binder	19 liters	Asphalt Plant
Combined Coarse and Fine Aggregate Bulk Sampling	1 for each aggregate combination	400 kg	Asphalt Plant
HMAC Surface Layer Bulk Sampling - 6 or 34 split off samples (for GC Specimens) + 2 or 3 uncompacted samples	6 + 2 34 + 3 6 + 2	4700g + 2000g 4700-5700g+2000g 4700g + 2000g	090901/090903 090902 090960/090961/ 090962
Asphalt Cement and Constituent Aggregate Samples to prepare 9/40 GC Specimens and 1 uncompacted sample	9 + 1 40 + 1 9 + 1	4700g + 2000g 4700-5700g+2000g 4700g + 2000g	090901/090903 090902 090960/090961/ 090962

B. Materials for Shipping to the FHWA - LTPP Materials Reference Library

Material Description	Number of Samples	Quantity of Each Sample	Sample Location
Asphalt Cement Bulk Sampling	1 for each type of binder	19 liters	Asphalt Plant
Constituent Aggregate Bulk Sampling	10 for each aggregate combination	19 liter pails	Asphalt Plant
Lab Mix GC Specimen Plant Mix GC Specimen	20 20	5700 g 5700 g	090902 090902

Table 9. Field and Laboratory Material Testing

Test Type	LTPP Test Des.	LTPP Protocol	No. of Tests	Material Source /Test Location
Subgrade Layer				
Sieve Analysis	SS01	P51	12	BS01AXX,BS02AXX
Atterberg Limits	SS03	P43	12	BS01AXX,BS02AXX
Classification	SS04	P52	12	BS01AXX,BS02AXX
Natural Moisture Content	SS09	P49	12	MS01AXX,MS02AXX
Unbound Subbase/Base Layers				
Particle Size Analysis	UG01	P41	12	BG01AXX,BG02AXX
Sieve Analysis (washed)	UG02	P41	24	BG03AXX,BG04AXX BG01AXX,BG02AXX
Atterberg Limits	UG04	P43	24	BG03AXX,BG04AXX BG01AXX,BG02AXX
Classification	UG08	P47	24	BG03AXX,BG04AXX BG01AXX,BG02AXX
Natural Moisture Content	UG10	P49	24	MG03AXX,MG04AXX MG01AXX,MG02AXX
Asphalt Bound Layers				
Core Examination	AC01	P01	12	CA01AXX,CA02AXX
Aggregates				**VIRGIN - RAP**
Combined Aggregate Gradation	AG04	P14	4	BU01A01/02 - BU01A60/62
Specific Gravity of Coarse Agg.	AG01	P11	4	BU01A01/02 - BU01A60/62
Specific Gravity of Fine Agg.	AG02	P12	4	BU01A01/02 - BU01A60/62
Specific Gravity of Pass 200		A T100	4	BU01A01/02 - BU01A60/62
Coarse Agg. Angularity		TM621	4	BU01A01/02 - BU01A60/62
Fine Agg Angularity		C1252	4	BU01A01/02 - BU01A60/62
Toughness		A T96	4	BU01A01/02 - BU01A60/62
Soundness		A T104	4	BU01A01/02 - BU01A60/62
Deleterious Material		A T112	4	BU01A01/02 - BU01A60/62
Clay Content		A T176	4	BU01A01/02 - BU01A60/62
Thin, Elongated Particles		D4791	4	BU01A01/02 - BU01A60/62
Asphalt Cement				**AC20/PG64-28/64-22/same 3 RAP**
Penetration @ 5°c		A T49	6*	BC01A01/02/03/60/61/62
Penetration @ 25°C, 46°C	AE02	P22	12*	BC01A01/02/03/60/61/62
Viscosity @ 60°C, 135°C	AE05	P25	24	BC01A01/02/03/60/61/62
Specific Gravity @ 16°C	AE03	P23	12	BC01A01/02/03/60/61/62
Dynamic Sheer @ 3 temps.		A TP5	12	BC01A01/02/03/60/61/62
Brookfield Vis. @ 135°C, 165°C		D4402	12	BC01A01/02/03/60/61/62
Rolling Thin Film (RTFOT)		A T240	Note	BC01A01/02/03/60/61/62
Dynamic Sheer on RTFOT Residue @ 3 temps.		A TP5	12	BC01A01/02/03/60/61/62
Pressure Aging (PAV) of RTFOT Residue		A PP1	Note	BC01A01/02/03/60/61/62
Creep Stiffness of PAV Residue (2 temps) - 24h conditioning		A TP1	12	BC01A01/02/03/60/61/62
Creep Stiffness of PAV Residue (2 temps)		A TP1	12	BC01A01/02/03/60/61/62
Dynamic Sheer on PAV Residue (3 temps)		A TP5	12	BC01A01/02/03/60/61/62
Direct Tension on PAV Residue (2 temps)		A TP3	12	BC01A01/02/03/60/61/62

XX Section Numbers 01, 02, 03, 60, 61, and 62

Note Sufficient material should be conditioned for the required tests

A = AASHTO tests. C1252 & D4791 & D4402 are ASTM tests. TM621 is a PA DOT test

* Three penetration readings are required from each test

Table 10A. Superpave™ Gyratory Compaction Effort

Design ESALs (millions)	Average Design High Air Temperature: < 39°C			39 - 40°C			41 - 42°C			43 - 44°C		
	N_{ini}	N_{des}	N_{max}	N_{ini}	N_{des}	N_{max}	N_{ini}	N_{des}	N_{max}	N_{ini}	N_{des}	N_{max}
< 0.3	7	68	104	7	74	114	7	78	121	7	82	127
0.3 - 1	7	76	117	7	83	129	7	88	138	8	93	146
1 - 3	7	86	134	8	95	150	8	100	158	8	105	167
3 - 10	8	96	152	8	106	169	8	113	181	9	119	192
10 - 30	8	109	174	9	121	195	9	128	208	9	135	220
30 - 100	9	126	204	9	139	228	9	146	240	10	153	253
> 100	9	142	233	10	158	262	10	165	275	10	172	288

Table 10B. Superpave™ Gyratory Compaction Effort for the SPS-9A Projects in the NA Region

NARO Project Location	Air Temp. Highest / Mean 7 Day	Design ESALs (millions)	N_{ini}	N_{des}	N_{max}
Colchester - Connecticut 090900	34°C / 30°C	1.85	7	86	134
Allentown - New Jersey 340900	37°C / 33°C	25.00	8	109	174
Moncure - North Carolina 370900	39°C / 36°C	3.32	8	96	152
Petawawa - Ontario 870900	34°C / 30°C	2.65	7	86	134
Shipshaw - Quebec 890900 & 89A900	33°C / 29°C	0.50	7	76	117

Table 11. Level 1 Testing of Virgin (Sections 090901 and 090903) and RAP (Sections 090960, 090961, and 090962) Paver and Laboratory Prepared Mixes

Laboratory Test	LTPP Test Desig.	LTPP Protocol	No of Tests / Section	Source of Material (Specimen)
Lab Samples Mix Design Testing				
Gyratory Compaction at Design Asph Cont @ N_{max} (150 mm dia. x 115 mm height specimen)		AASHTO TP4	3	NA01AXX-NA03AXX (LA01AXX-LA03AXX)
Gyratory Compaction @ 7% Air Voids (150 mm dia. x 95 mm height specimen)		AASHTO TP4	6	NA04AXX-NA09AXX (LA04AXX-LA09AXX)
Bulk Specific Gravity	AC02	P02	9	LA01AXX-LA09AXX
Maximum Specific Gravity	AC03	P03	1	NA03AXX
Moisture Susceptibility	AC05	P05	1	LA04AXX-LA09AXX
Volumetric Calculations Volume % of Air Voids % Voids in Mineral Agg Voids Filled with Asph.		AASHTO PP19	 3 3 3	 LA01AXX-LA03AXX LA01AXX-LA03AXX LA01AXX-LA03AXX
Field Samples Quality Control Related Testing				
Gyratory Compaction @ N_{max}		AASHTO TP4	6	BA01AXX-BA06AXX (DA01AXX-DA06AXX)
Bulk Specific Gravity	AC02	P02	6	DA01AXX-DA06AXX
Asphalt Content-Extraction	AC04	P04	2	BA01AXX, BA06AXX
Agg Gradation-Extracted	AG04	P14	2	BA01AXX, BA06AXX
Maximum Specific Gravity	AC03	P03	2	BA01AXX, BA06AXX
Volumetric Calculations Volume % of Air Voids % Voids in Mineral Agg Voids Filled with Asph.		AASHTO PP19	 6 6 6	 DA01AXX-DA06AXX DA01AXX-DA06AXX DA01AXX-DA06AXX

$N_{Init} = 7$ $N_{Design} = 86$ $N_{Max} = 134$

XX represents sections 01, 03, 60, 61, and 62.

Table 12. Level 3 Testing of Superpave™ Section 090902 Paver and Laboratory Prepared Mixes

Laboratory Test	LTPP Test Desig.	LTPP Protocol	No of Tests per Section	Source of Material (Specimen)
Lab Samples Mix Design Testing				
Gyratory Compaction at Design Asphalt Content @ N_{max}		AASHTO TP4	6	NA01A02-NA06A02 (LA01A02-LA06A02)
Gyratory Compaction @ 3% Air Voids		AASHTO TP4	2	NA07A02-NA08A02 (LA07A02-LA08A02)
Gyratory Compaction @ 7% Air Voids		AASHTO TP4	32	NA09A02-NA40A02 (LA09A02-LA40A02)
Bulk Specific Gravity	AC02	P02	15	LA01A02-LA06A02 LA09A02-LA14A02 LA07A02, LA15A02, LA38A02
Maximum Specific Gravity	AC03	P03	1	NA15A02
Moisture Susceptibility	AC05	P05	1	LA09A02-LA14A02
Volumetric Calculations				
Volume % of Air Voids		AASHTO PP19	6	LA01A02-LA06A02
%Voids in Mineral Aggregate			6	LA01A02-LA06A02
Voids Filled with Asphalt			6	LA01A02-LA06A02
LTPP Performance Tests *				
Indirect Tensile Strength	AC07	P07	4	LA15A02-LA18A02
Resilient Modulus	AC07	P07	1	LA16A02-LA18A02
Creep Compliance	AC06	P06	4	LA19A02-LA22A02
Field Samples Quality Control Related Testing				
Gyratory Compaction @ N_{Max}		AASHTO TP4	6	BA02-04A02, BA31-33A02 DA02-04A02, DA31-33A02
Gyratory Compaction @ 3% Air Voids		AASHTO TP4	2	BA01A02, BA34A02 (DA01A02, DA34A02)
Gyratory Compaction @ 7% Air Voids		AASHTO TP4	26	BA05A02-BA30A02 (DA05A02-DA30A02)
Bulk Specific Gravity	AC02	P02	9	DA02A02-DA04A02 DA31A02-DA33A02 DA06A02, DA16A02, DA22A02
Asphalt Content - Extraction	AC04	P04	3	BA05A02, BA06A02, BA34A02
Agg Gradation - Extracted Agg	AG04	P14	3	BA05A02, BA06A02, BA34A02
Maximum Specific Gravity	AC03	P03	3	BA05A02, BA06A02, BA34A02
Volumetric Calculations				
Volume % of Air Voids		AASHTO PP19	6	DA02-04A02, DA31-33A02
%Voids in Mineral Aggregate			6	DA02-04A02, DA31-33A02
Voids Filled with Asphalt			6	DA02-04A02, DA31-33A02
LTPP Performance Tests *				
Indirect Tensile Strength	AC07	P07	4	DA05,DA09,DA17,DA29A02
Resilient Modulus	AC07	P07	1	DA09A02,DA17A02,DA29A02
Creep Compliance	AC06	P06	4	DA15,DA16,DA18,DA30A02

$N_{Init} = 7$ $N_{Design} = 86$ $N_{Max} = 134$

* 100 mm diameter test specimen will be cored from the 152 mm diameter specimen

Superpave™ testing by the Superpave™ Regional Test Center is yet to be finalized

Meanwhile the gyratory compacted lab and field samples are to be sent to MRL for storage.

Table 13. Laboratory Testing of Cores at All Intervals

Laboratory Test	LTPP Test D.	LTPP Protocol	Tests per Section	Source of Material (Specimen)
All Intervals Sections 01,03, 60, 61, & 62, Intervals B-F Section 02				
Core Examination / Thickness	AC01	P01	8	All Cores from All Sections
Bulk Specific Gravity	AC02	P02	8	All Cores from All Sections
Maximum Specific Gravity	AC03	P03	2	CA01tXX, CA08tXX
Asphalt Content - Extraction	AC04	P04	8	All Cores from All Sections
Agg. Gradation - Extracted Agg	AG04	P14	2	CA01tXX, CA08tXX
Volumetric Calculations *				
Volume % of Air Voids		AASHTO	2	CA01tXX, CA08tXX
%Voids in Mineral Aggregate		PP19	2	CA01tXX, CA08tXX
Voids Filled with Asphalt			2	CA01tXX, CA08tXX
Recovered Asphalt Cement				
Abson Recovery	AE01	P21	8	All Cores from All Sections
Penetration @ 5°C		AASHTO T49	3***	Combined recovered AC from sec.
Penetration @ 25°C, 46°C	AE02	P22	6***	Combined recovered AC from sec.
Viscosity @ 60°C, 135°C	AE05	P25	12	Combined recovered AC from sec.
Specific Gravity @ 16°C	AE03	P23	6	Combined recovered AC from sec.
Dynamic Sheer @ 3 temps.**		AASHTO TP5	6	Combined recovered AC from sec.
Creep Stiffness @ 2 temps.**		AASHTO TP1	6	Combined recovered AC from sec.
Direct Tension @ 2 temps.**		AASHTO TP3	6	Combined recovered AC from sec.
Interval A Section 02				
Core Examination / Thickness	AC01	P01	18	All Cores from Section
Bulk Specific Gravity	AC02	P02	8	CA02,06,11,15,19,24,28,33A02
Maximum Specific Gravity	AC03	P03	2	CA11A02, CA24A02
Asphalt Content - Extraction	AC04	P04	8	CA02,06,11,15,19,24,28,33A02
Agg Gradation - Extracted Agg	AG04	P14	2	CA11A02, CA24A02
Volumetric Calculations *				
Volume % of Air Voids		AASHTO	2	CA11A02, CA24A02
%Voids in Mineral Aggregate		PP19	2	CA11A02, CA24A02
Voids Filled with Asphalt			2	CA11A02, CA24A02
Recovered Asphalt Cement				
Abson Recovery	AE01	P21	8	CA02,06,11,15,19,24,28,33A02
Penetration @ 5°C		AASHTO T49	3***	Combined recovered AC from sec.
Penetration @ 25°C, 46°C	AE02	P22	6***	Combined recovered AC from sec
Viscosity @ 60°C, 135°C	AE05	P25	12	Combined recovered AC from sec.
Specific Gravity @ 16°C	AE03	P23	6	Combined recovered AC from sec.
Dynamic Sheer @ 3 temps **		AASHTO TP5	6	Combined recovered AC from sec
Creep Stiffness @ 2 temps **		AASHTO TP1	6	Combined recovered AC from sec.
Direct Tension @ 2 temps.**		AASHTO TP3	6	Combined recovered AC from sec.
LTPP Performance Tests ****				
Indirect Tensile Strength	AC07	P07	4	CA07,CA16,CA21,CA31A02
Resilient Modulus	AC07	P07	1	CA16A02,CA21A02,CA31A02
Creep Compliance	AC06	P06	4	CA03,CA14,CA23,CA32A02

t = interval A(0 months), B(6 months), C(12 months), D(18 months), E(24 months), and F(48 months)

* Estimate maximum theoretical specific gravity using extracted AC content and aggregate effective S G determined during construction.

** The test temperatures should be the same as those used for the tests on the RTFOT-PAV conditioned samples performed during the initial binder grading

*** Three penetration readings are required from each test.

**** 100 mm diameter test specimen will be cored from the 152 mm diameter cores.

Superpave™ testing by the Superpave™ Regional Test Center is yet to be finalized. Meanwhile 16 cores are to be collected at a later date. XX=test section 01,02,03,60,61, and 62.

Table 14. Lab, Field, and Core Superpave™ Samples Assigned Laboratory for Testing

Sample Type	ConnDOT Lab	LTPP Contractor Lab	Superpave Reg. Test Centre Lab	Remarks
Lab Samples	LA01A02 N_{max}	LA15A02 7%AV	LA07A02 3%AV	12 - **DOT** Lab
	LA02A02 N_{max}	LA16A02 7%AV	LA08A02 3%AV	8 - LCL Lab
	LA03A02 N_{max}	LA17A02 7%AV	LA23A02 7%AV	20 SRTC Lab
	LA04A02 N_{max}	LA18A02 7%AV	LA24A02 7%AV	**Total - 40 GCS**
	LA05A02 N_{max}	LA19A02 7%AV	LA25A02 7%AV	1 loose sample
	LA06A02 N_{max}	LA20A02 7%AV	LA26A02 7%AV	for **DOT** Lab
	LA09A02 7%AV	LA21A02 7%AV	LA27A02 7%AV	NA15A02
	LA10A02 7%AV	LA22A02 7%AV	LA28A02 7%AV	
	LA11A02 7%AV		LA29A02 7%AV	3 Bulk Specific
	LA12A02 7%AV		LA30A02 7%AV	Gravity by **DOT**
	LA13A02 7%AV		LA31A02 7%AV	before sending to
	LA14A02 7%AV		LA32A02 7%AV	other Labs
			LA33A02 7%AV	LA07,15,38A02
			LA34A02 7%AV	
			LA35A02 7%AV	Moisture
			LA36A02 7%AV	Susceptibility by
			LA37A02 7%AV	**DOT** Lab
			LA38A02 7%AV	LA09-14A02
			LA39A02 7%AV	**Total = 40 Lab**
			LA40A02 7%AV	**GCS + 1 Loose**
Field Samples	DA02A02 N_{max}	DA05A02 7%AV	DA01A02 3%AV	
	DA03A02 N_{max}	DA09A02 7%AV	DA06A02 7%AV	6 - **DOT** Lab
	DA04A02 N_{max}	DA15A02 7%AV	DA07A02 7%AV	8 - LCL Lab
	DA31A02 N_{max}	DA16A02 7%AV	DA08A02 7%AV	20 SRTC Lab
	DA32A02 N_{max}	DA17A02 7%AV	DA10A02 7%AV	**Total - 34 GCS**
	DA33A02 N_{max}	DA18A02 7%AV	DA11A02 7%AV	
		DA29A02 7%AV	DA12A02 7%AV	3 loose samples
		DA30A02 7%AV	DA13A02 7%AV	for **DOT** Lab
			DA14A02 7%AV	BA05,06,34A02
			DA19A02 7%AV	
			DA20A02 7%AV	3 Bulk Specific
			DA21A02 7%AV	Gravity by **DOT**
			DA22A02 7%AV	Lab before
			DA23A02 7%AV	sending to other
			DA24A02 7%AV	Labs
			DA25A02 7%AV	DA06,16,22A02
			DA26A02 7%AV	
			DA27A02 7%AV	**Total = 34 Field**
			DA28A02 7%AV	**GCS + 3 Loose**
			DA34A02 3%AV	
Cores	CA02A02	CA03A02	CA01A02*	8 - **DOT** Lab
	CA06A02	CA07A02	CA04A02*	2 - **DOT** (spare)
	CA11A02	CA14A02	CA08-10A02*	8 - LCL Lab
	CA15A02	CA16A02	CA12-13A02*	16 SRTC Lab*
	CA19A02	CA21A02	CA17-18A02*	**Total - 34 Cores**
	CA24A02	CA23A02	CA20A02*	Maximum
	CA28A02	CA31A02	CA22A02*	Specific Gravity
	CA33A02	CA32A02	CA26-27A02*	and Extraction -
	CA05A02 spare		CA29-30A02*	**DOT**
	CA25A02 spare		CA34A02*	CA11,24A02
Total	**12+6+10=28**	**8+8+8=24**	**20+20+16*=56**	**28+24+56=108**

* The 16 cores, intended for the Superpave Regional Test Centre, are postponed to a later stage.

Table 15. Field Activities Pre, During, and Post Construction

		Pre Construction			During and Post Construction					
	Material Type - Traffic Direction	Subg./ Embank. Layers	Base/ Subbase Layers	Existing AC Surface	Milled AC Surface	AC Leveling Layer	AC Surface Layer 0 months	AC Surface Layer 6 months	AC Cement	Combined Aggreg. Material
In-Situ Density	Virgin - EB					97/06/03 97/06/05 97/06/06	97/06/23 97/07/15 97/06/28			
	RAP - WB					97/05/21 97/05/22 97/06/10	97/08/07 97/09/08 97/08/12			
Shoulder Probe	Virgin - EB	96/09/09 96/09/10								
	RAP - WB	96/09/10 96/09/11								
Bulk and Moisture Sampling	Virgin - EB	96/09/09 96/09/10	96/09/09 96/09/10				97/06/23 97/07/15 97/06/28		97/06/23 97/07/15 97/06/28	97/06/23 97/07/15
	RAP - WB	96/09/10 96/09/11	96/09/10 96/09/11				97/08/07 97/09/08 97/08/12		97/08/07 97/09/08 97/08/12	97/08/07 97/08/12
Video Recording	Virgin - EB			97/04/09			97/10/28			
	RAP - WB			97/04/09			97/10/28			
Site Markings	Virgin - EB			97/04/08			97/09/15 97/09/16			
	RAP - WB			97/04/08 97/04/09			97/09/16 97/09/17			
Profilo-meter Testing	Virgin - EB			97/04/09			97/10/28			
	RAP - WB			97/04/09			97/10/28			
FWD Testing	Virgin - EB			97/04/08			97/10/28 97/10/29			
	RAP - WB			97/04/08 97/04/09			97/10/29 97/10/30			
MDS and Dipstick™ Survey	Virgin - EB			97/04/08	97/05/29 97/06/04		97/10/28 97/10/29	98/04/01 98/04/02		
	RAP - WB			97/04/08 97/04/09	97/05/01 97/05/16 97/06/09		97/10/29 97/10/30	98/04/02 98/04/03		
Coring	Virgin - EB			96/09/09 96/09/10			97/09/15 97/09/16	98/04/01 98/04/02		
	RAP - WB			96/09/10 96/09/11			97/09/16 97/09/17	98/04/02 98/04/03		

Date format is in yy/mm/dd

Table 16. SPS-9A Guidelines vs. Actual Monitoring Measurement Dates

Measurement Type	Monitoring Period After Construction	Monitoring Date as per the Guidelines - Construction Finished Virgin (EB) - 15 July 97 RAP (WB) - 08 Sep 97	Actual Monitoring Completion Date After Construction
Deflection	1-3 Months*	15 Aug - Oct 97 (Virgin/EB) 08 Oct - Dec 97 (RAP/WB)	29 Oct 97 (Virgin/EB)[1] 30 Oct 97 (RAP/WB)
Profile	< 2 Months	Before 15 Sep 97 (Virgin/EB) 08 Nov 97 (RAP/WB)	28 Oct 97 (Virgin/EB)[2] 28 Oct 97 (RAP/WB)
Distress Survey	< 6 Months	Before 15 Jan 98 (Virgin/EB) 08 Mar 98 (RAP/WB)	29 Oct 97 (Virgin/EB) 30 Oct 97 (RAP/WB)
Friction	3-12 Months	15 Oct 97-15 Jul 98 (Virgin/EB) 08 Dec 97-08 Sep 98 (RAP/WB)	

Note. Date format is in dd mmm yy

* The LTPP Manual for FWD Testing, Version 2.0/February 1993, requires that FWD testing for SPS-9A be performed 3 to 6 months after construction is completed.

1 Two weeks delay

2 Six weeks delay

Table 17. IRI Values from the Profilometer™ Survey, Before and After Construction

	Profilometer™ Survey Before Construction 09 Apr 97			Profilometer™ Survey After Construction 28 Oct 97			ARAN Survey After Const.
Section ID	Left WP IRI of 5 Runs (m/km)	Right WP IRI of 5 Runs (m/km)	Both WPs IRI of 5 Runs (m/km)	Left WP IRI of 5 Runs (m/km)	Right WP IRI of 5 Runs (m/km)	Both WPs IRI of 5 Runs (m/km)	Average of Both WPs IRI (m/km)
East Bound Overlay Construction Virgin Materials							
090901	1.225	1.366	1.296	0.952	1.074	1.014	1.130
090902	1.221	1.360	1.291	0.826	1.226	1.026	1.105
090903	1.514	1.640	1.577	1.112	0.965	1.039	1.114
West Bound Overlay Construction RAP Materials							
090960	1.059	1.267	1.163	0.940	1.026	0.983	1.056
090961	1.731	1.715	1.723	0.902	0.998	0.951	1.053
090962	1.349	1.238	1.294	0.867	1.011	0.939	1.070

Plots of Profilometer™ Elevations, Left Wheel Path and Right Wheel Path, are presented in Figures 14-19 The construction guidelines state that the finished surface of the overlay should be smooth and provide an excellent ride level As a target, the as-constructed surface should have a pro-rated profile index of less than 160-mm per km as measured by a California type Profilograph and evaluated following California Test 526.

Table 18. Distress Survey of the SPS-9A Monitoring Sections, Before and After Construction

Section 090901

Distress Type	Pre Construction 08-09 Apr 1997			Post Milling 01 May - 09 Jun 1997			Post Const. 28-30 Oct 1997	Post Const. 01-03 Apr 1998
Severity Level	**low**	**mod.**	**high**	**low**	**mod.**	**high**	**low/ mod/ high**	**low/ mod/ high**
Fatigue Cracking (square meters)	0	0	0	0	0	0	0	0
Longitudinal Cracking (meters)								
Wheel Path	42.5	0	0	0	0	0	0	0
(length sealed)	42.0	0	0	0	0	0	0	0
Non Wheel Path	252.0	12.5	0	0.3	0	0	0	0
(length sealed)	243.5	0	0	0	0	0	0	0
Transverse Cracking								
Number of Cracks	11	1	0	4	2	0	0	0
Length (meters)	18.5	2.6	0	1.0	1 0	0	0	0
(length sealed m)	15.0	0	0	0	0	0	0	0
Patch/Patch Deterioration								
Number	0	0	0	1	0	0	0	0
(square meters)	0	0	0	0.1	0	0	0	0
Potholes								
Number	1	0	0	1	0	0	0	0
(square meters)	0.1	0	0	0.1	0	0	0	0
Bleeding (square meters)	0	0	0	0	0	0	0	0
Raveling (square meters)	2 5	4 2	0	0	0	0	0	0

Note The post milling manual distress survey MDS was performed immediately after milling of the existing surface.

Table 18(Cont.). Distress Survey of the SPS-9A Monitoring Sections, Before and After Construction

Section 090902

Distress Type	Pre Construction 08-09 Apr 1997			Post Milling 01 May - 09 Jun 1997			Post Const. 28-30 Oct 1997	Post Const. 01-03 Apr 1998
Severity Level	low	mod.	high	low	mod.	high	low/ mod/ high	low/ mod/ high
Fatigue Cracking (square meters)	0	0	0	0	0	0	0	0
Longitudinal Cracking (meters)								
Wheel Path	14 9	0	0	1 1	0	0	0	0
(length sealed)	5 9	0	0	0	0	0	0	0
Non Wheel Path	38 2	0	0	16 8	0	0	0	0
(length sealed)	33 8	0	0	0	0	0	0	0
Transverse Cracking								
Number of Cracks	15	2	0	20	0	0	0	0
Length (meters)	22.7	6 1	0	27 5	0	0	0	0
(length sealed m)	16 4	0	0	0	0	0	0	0
Patch/Patch Deterioration								
Number	0	0	0	0	0	0	0	0
(square meters)	0	0	0	0	0	0	0	0
Potholes								
Number	0	0	0	0	0	0	0	0
(square meters)	0	0	0	0	0	0	0	0
Bleeding (square meters)	3 0	0	0	0	0	0	0	0
Raveling (square meters)	3 2	5 6	0	0	0	0	0	0

Note. The post milling manual distress survey MDS was performed immediately after milling of the existing surface

Table 18(Cont.). Distress Survey of the SPS-9A Monitoring Sections, Before and After Construction

Section 090903

Distress Type	Pre Construction 08-09 Apr 1997			Post Milling 01 May - 09 Jun 1997			Post Const. 28-30 Oct 1997	Post Const. 01-03 Apr 1998
Severity Level	**low**	**mod.**	**high**	**low**	**mod.**	**high**	**low/ mod/ high**	**low/ mod/ high**
Fatigue Cracking (square meters)	1.2	0	0	0	0	0	0	0
Longitudinal Cracking (meters)								
Wheel Path	6 7	0	1.7	3.7	0	0	0	0
(length sealed)	5 0	0	0	0	0	0	0	0
Non Wheel Path	13.0	0	0	1.0	0	0	0	0
(length sealed)	13.0	0	0	0	0	0	0	0
Transverse Cracking								
Number of Cracks	9	2	0	18	0	0	0	0
Length (meters)	9 6	1 8	0	9.3	0	0	0	0
(length sealed m)	5.0	0	0	0	0	0	0	0
Patch/Patch Deterioration								
Number	0	2	0	7	0	0	0	0
(square meters)	0	1 2	0	0 4	0	0	0	0
Potholes								
Number	0	0	0	0	0	0	0	0
(square meters)	0	0	0	0	0	0	0	0
Bleeding (square meters)	13 7	0	0	0	0	0	0	0
Raveling (square meters)	4 0	6 5	0	0	0	0	0	0

Note: The post milling manual distress survey MDS was performed immediately after milling of the existing surface

Table 18(Cont.). Distress Survey of the SPS-9A Monitoring Sections, Before and After Construction

Section 090960

Distress Type	Pre Construction 08-09 Apr 1997			Post Milling 01 May - 09 Jun 1997			Post Const. 28-30 Oct 1997	Post Const. 01-03 Apr 1998
Severity Level	**low**	**mod.**	**high**	**low**	**mod.**	**high**	**low/ mod/ high**	**low/ mod/ high**
Fatigue Cracking (square meters)	0	0	0	0	0	0	0	0
Longitudinal Cracking (meters)								
Wheel Path	3 5	0	0	0	0	0	0	0
(length sealed)	3 5	0	0	0	0	0	0	0
Non Wheel Path	20 2	0	0	0	0	0	0	0
(length sealed)	17 2	0	0	0	0	0	0	0
Transverse Cracking								
Number of Cracks	5	0	0	1	1	0	0	0
Length (meters)	6 6	0	0	1 1	3 7	0	0	0
(length sealed m)	3 1	0	0	0	0	0	0	0
Patch/Patch Deterioration								
Number	0	0	0	11	0	0	0	0
(square meters)	0	0	0	0.6	0	0	0	0
Potholes								
Number	0	0	0	2	0	0	0	0
(square meters)	0	0	0	0 2	0	0	0	0
Bleeding (square meters)	14 0	0	0	0	0	0	0	0
Raveling (square meters)	61 0	0	0	0	0	0	0	0

Note. The post milling manual distress survey MDS was performed immediately after milling of the existing surface

Table 18(Cont.). Distress Survey of the SPS-9A Monitoring Sections, Before and After Construction

Section 090961

Distress Type	Pre Construction 08-09 Apr 1997			Post Milling 01 May - 09 Jun 1997			Post Const. 28-30 Oct 1997	Post Const. 01-03 Apr 1998
Severity Level	**low**	**mod.**	**high**	**low**	**mod.**	**high**	**low/ mod/ high**	**low/ mod/ high**
Fatigue Cracking (square meters)	21 0	16.5	0	0	0	0	0	0
Longitudinal Cracking (meters)								
Wheel Path	10 0	0 8	0	0	0	0	0	0
(length sealed)	8.0	0.8	0	0	0	0	0	0
Non Wheel Path	10.6	2.0	0	0	0	0	0	0
(length sealed)	8 6	0	0	0	0	0	0	0
Transverse Cracking								
Number of Cracks	4	0	0	1	0	0	0	0
Length (meters)	5 3	0	0	0 6	0	0	0	0
(length sealed m)	4 1	0	0	0	0	0	0	0
Patch/Patch Deterioration								
Number	1	9	2	12	0	0	0	0
(square meters)	0 2	2 6	0 7	0 7	0	0	0	0
Potholes								
Number	0	1	0	0	0	0	0	0
(square meters)	0	0 1	0	0	0	0	0	0
Bleeding (square meters)	6 5	0	0	0	0	0	0	0
Raveling (square meters)	0	4 8	0	0	0	0	0	0

Note The post milling manual distress survey MDS was performed immediately after milling of the existing surface

Table 18(Cont.). Distress Survey of the SPS-9A Monitoring Sections, Before and After Construction

Section 090962

Distress Type	Pre Construction 08-09 Apr 1997			Post Milling 01 May - 09 Jun 1997			Post Const. 28-30 Oct 1997	Post Const. 01-03 Apr 1998
Severity Level	**low**	**mod.**	**high**	**low**	**mod.**	**high**	**low/ mod/ high**	**low/ mod/ high**
Fatigue Cracking (square meters)	2.0	3 9	0	0	0	0	0	0
Longitudinal Cracking (meters)								
Wheel Path	39 5	0	0	0	0	7 0	0	0
(length sealed)	37.5	0	0	0	0	0	0	0
Non Wheel Path	86 3	9 5	0	0 3	0	0	0	0
(length sealed)	73.0	0	0	0	0	0	0	0
Transverse Cracking								
Number of Cracks	5	0	0	2	0	0	0	0
Length (meters)	4 7	0	0	0 8	0	0	0	0
(length sealed m)	1 7	0	0	0	0	0	0	0
Patch/Patch Deterioration								
Number	1	0	0	6	0	0	0	0
(square meters)	0 1	0	0	0 3	0	0	0	0
Potholes								
Number	0	0	0	0	0	0	0	0
(square meters)	0	0	0	0	0	0	0	0
Bleeding (square meters)	12 3	0	0	0	0	0	0	0
Raveling (square meters)	0	0	0	0	0	0	0	0

Note The post milling manual distress survey MDS was performed immediately after milling of the existing surface

Table 19. Rut Depth from the Dipstick™ Survey, Before and After Construction

Section ID	Before Construction 08-09 Apr 97		After Construction 28-30 Oct 97		After Construction 01-03 Apr 98	
	LWP Avg Rut Depth (mm)	**RWP** Avg Rut Depth (mm)	**LWP** Avg Rut Depth (mm)	**RWP** Avg Rut Depth (mm)	**LWP** Avg Rut Depth (mm)	**RWP** Avg Rut Depth (mm)
East Bound Overlay Construction Virgin Materials						
090901	2.5 mm	2.0 mm	2.1 mm	0.1 mm	1.8 mm	0.0 mm
090902	2.9 mm	1.4 mm	1.6 mm	0.2 mm	1.1 mm	0.1 mm
090903	7.4 mm	3.6 mm	2.7 mm	0.2 mm	2.5 mm	0.2 mm
West Bound Overlay Construction RAP Materials						
090960	5.1 mm	3.7 mm	0.2 mm	0.1 mm	0.1 mm	0.1 mm
090961	4.9 mm	3.2 mm	2.0 mm	0.1 mm	2.2 mm	0.1 mm
090962	3.5 mm	3.0 mm	0.7 mm	0.1 mm	1.0 mm	0.0 mm

Rut Depth Plots, Left Wheel Path (LWP) and Right Wheel Path (RWP), are presented in Figures 20-25

Table 20. Dates of Construction of Layers

Section ID & Layer Thickness (mm)	AC Milling Operation dd mmm yy	AC Leveling Paving dd mmm yy	AC Surface Paving dd mmm yy
East Bound Overlay Construction Virgin Materials			
090901 250 GRAVEL SUBBASE			
100 GRAVEL BASE			
150 EXISTING AC BASE			
100 EXISTING AC BINDER	29 May 97		
25 OVERLAY AC LEVELING		03 Jun 97	
63 OVERLAY AC SURFACE			23 Jun 97
090902 250 GRAVEL SUBBASE			
100 GRAVEL BASE			
150 EXISTING AC BASE			
100 EXISTING AC BINDER	03 Jun 97		
25 OVERLAY AC LEVELING		05 Jun 97	
63 OVERLAY AC SURFACE			15 Jul 97
090903 250 GRAVEL SUBBASE			
100 GRAVEL BASE			
150 EXISTING AC BASE			
100 EXISTING AC BINDER	04 Jun 97		
25 OVERLAY AC LEVELING		06 Jun 97	
63 OVERLAY AC SURFACE			28 Jun 97
West Bound Overlay Construction RAP Materials			
090960 250 GRAVEL SUBBASE			
100 GRAVEL BASE			
150 EXISTING AC BASE			
100 EXISTING AC BINDER	01 May 97		
25 OVERLAY AC LEVELING		21 May 97	
63 OVERLAY AC SURFACE			07 Aug 97
090961 250 GRAVEL SUBBASE			
100 GRAVEL BASE			
150 EXISTING AC BASE			
100 EXISTING AC BINDER	16 May 97		
25 OVERLAY AC LEVELING		22 May 97	
63 OVERLAY AC SURFACE			08 Sep 97
090962 250 GRAVEL SUBBASE			
100 GRAVEL BASE			
150 EXISTING AC BASE			
100 EXISTING AC BINDER	09 Jun 97		
25 OVERLAY AC LEVELING		10 Jun 97	
63 OVERLAY AC SURFACE			12 Aug 97

Table 21. Paving Dates, Times, Locations, Thickness, Temperature and Weather Conditions

Date dd mmm yy	Time	Section ID	AC Layer	Thick (mm)	# / Average Laydown Temps. °C	Air Temp °C	Weather
21 May 97		090960	Leveling	25	6* / 124	14	Partly Cloudy
22 May 97		090961	Leveling	25	6* / 135	13	Partly Cloudy
03 Jun 97	1118-1132	090901	Leveling	25	6* / 134	17	Partly Cloudy
05 Jun 97		090902	Leveling	25	6* / 138	17	Partly Cloudy
06 Jun 97		090903	Leveling	25	6* / 137	19	Partly Cloudy
10 Jun 97		090962	Leveling	25	6* / 144	28	Sunny
23 Jun 97	1136-1202	090901	Surface	63	6* / 146	27	Sunny
28 Jun 97	1028-1054	090903	Surface	63	6* / 140	27	Sunny
15 Jul 97	1054-1131	090902	Surface	63	6* / 144	32	Sunny
07 Aug 97	1041-1108	090960	Surface	63	6* / 134	23	Sunny
12 Aug 97	1036-1101	090962	Surface	63	6* / 136	23	Sunny
08 Sep 97	1203-1225	090961	Surface	63	6* / 154	18	Cloudy

* Number of times laydown temperature was measured while paving and the range of temperatures (min-max)
Refer to Figure 11 for more details on the paving of the surface layer

Table 22. SPS-9A Nuclear Gauge In Situ Densities

Section ID	Offset (m)	Density kg/m^3 (Station 30)*	Density kg/m^3 (Station 76)*	Density kg/m^3 (Station 122)*
East Bound Overlay Construction Virgin Materials				
090901 250 GRAV SUBBASE				
100 GRAVEL BASE				
150 EXISTING AC BASE				
100 EXISTING AC BINDER				
25 OVERLAY AC LEVELING	0 9	2268	2279	2316
63 OVERLAY AC SURFACE	0 9	2244	2335	2287
090902 250 GRAV SUBBASE				
100 GRAVEL BASE				
150 EXISTING AC BASE				
100 EXISTING AC BINDER				
25 OVERLAY AC LEVELING	0 9	2385	2369	2371
63 OVERLAY AC SURFACE	0 9	2321	2313	2257
090903 250 GRAV SUBBASE				
100 GRAVEL BASE				
150 EXISTING AC BASE				
100 EXISTING AC BINDER				
25 OVERLAY AC LEVELING	0 9	2211	2223	2246
63 OVERLAY AC SURFACE	0 9	2323	2265	2287
West Bound Overlay Construction RAP Materials				
090960 250 GRAV SUBBASE				
100 GRAVEL BASE				
150 EXISTING AC BASE				
100 EXISTING AC BINDER				
25 OVERLAY AC LEVELING	0 9	2270	2279	2334
63 OVERLAY AC SURFACE	0 9	2345	2291	2302
090961 250 GRAV SUBBASE				
100 GRAVEL BASE				
150 EXISTING AC BASE				
100 EXISTING AC BINDER				
25 OVERLAY AC LEVELING	0 9	2334	2198	2326
63 OVERLAY AC SURFACE	0 9	2283	2316	2300
090962 250 GRAV SUBBASE				
100 GRAVEL BASE				
150 EXISTING AC BASE				
100 EXISTING AC BINDER				
25 OVERLAY AC LEVELING	0 9	2239	2193	2236
63 OVERLAY AC SURFACE	0 9	2287	2260	2291

Notes * Stations at which densities were measured are 30, 76, and 122 m from the start of the section
Densities were measured in the Back Scatter Method
Campbell Pacific MC-3 Density Gauge was used for the Surface and Leveling layers.

Table 23 Core Thickness from the Field Material Sampling and Testing Forms

	Before Section Stations 0-				After Section Stations 5+				Design
Section ID	**Station m**	**Offset m**	**Core #**	**Surface Thickness**	**Station m**	**Offset m**	**Core #**	**Surface Thickness**	**Surface Thickness**
Interval	**A**	**0**	**months**						**(+10)mm**
090901	0-57 9	1 1	CA01A01	61	5+13 7	0.6	CA05A01	58	63
	0-56.4	0.6	CA02A01	61	5+15.2	1.1	CA06A01	58	(53-73)
	0-54 9	1 1	CA03A01	58	5+16 8	0.6	CA07A01	58	
	0-53 3	0 6	CA04A01	53	5+18.3	1 1	CA08A01	58	
090902	0-57 9	1 1	CA01A02	*	5+13 7	1 1	CA05A02	71	63
	0-56 4	0 6	CA02A02	64	5+15 2	0 6	CA06A02	66	(53-73)
	0-54.9	1.1	CA03A02	64	5+16 8	1 1	CA07A02	66	
	0-53.3	0.6	CA04A02	*	5+18 3	0 6	CA08A02	*	
	0-59 4	2 4	CA09A02	*	5+12.2	2.4	CA22A02	*	
	0-57.9	2 4	CA10A02	*	5+13.7	2 4	CA23A02	66	
	0-56 4	2 4	CA11A02	61	5+15 2	2 4	CA24A02	58	
	0-54 9	2 4	CA12A02	*	5+16 8	2 4	CA25A02	64	
	0-53 3	2 4	CA13A02	*	5+18 3	2.4	CA26A02	*	
	0-51 8	2 4	CA14A02	61	5+19 8	2 4	CA27A02	*	
	0-50 3	2 4	CA15A02	58	5+21 3	2 4	CA28A02	61	
	0-48 8	2.4	CA16A02	61	5+22 9	2.4	CA29A02	*	
	0-47.2	2 4	CA17A02	*	5+24 4	2.4	CA30A02	*	
	0-45.7	2.4	CA18A02	*	5+25.9	2.4	CA31A02	64	
	0-44 2	2 4	CA19A02	58	5+27 4	2 4	CA32A02	64	
	0-42 7	2 4	CA20A02	*	5+29 0	2 4	CA33A02	64	
	0-41.1	2 4	CA21A02	58	5+30.5	2 4	CA34A02	*	
090903	0-57 9	1.1	CA01A03	53	5+13.7	0.6	CA05A03	58	63
	0-56 4	0.6	CA02A03	58	5+15 2	1 1	CA06A03	58	(53-73)
	0-54 9	1 1	CA03A03	53	5+16 8	0 6	CA07A03	58	
	0-53 3	0.6	CA04A03	64	5+18 3	1 1	CA08A03	58	
090960	0-57 9	1 1	CA01A60	61	5+13 7	0 6	CA05A60	58	63
	0-56 4	0.6	CA02A60	58	5+15 2	1 1	CA06A60	58	(53-73)
	0-54.9	1.1	CA03A60	58	5+16 8	0 6	CA07A60	53	
	0-53 3	0 6	CA04A60	58	5+18 3	1 1	CA08A60	61	
090961	0-57 9	1 1	CA01A61	58	5+13.7	1.1	CA05A61	58	63
	0-56 4	0 6	CA02A61	61	5+15 2	0 6	CA06A61	53	(53-73)
	0-54 9	1 1	CA03A61	61	5+16.8	1 1	CA07A61	58	
	0-53 3	0.6	CA04A61	61	5+18.3	0.6	CA08A61	53	
090962	0-57 9	1.1	CA01A62	61	5+13 7	0.6	CA05A62	64	63
	0-56 4	0 6	CA02A62	61	5+15 2	1 1	CA06A62	64	(53-73)
	0-54.9	1.1	CA03A62	58	5+16 8	0.6	CA07A62	61	
	0-53 3	0.6	CA04A62	58	5+18 3	1.1	CA08A62	61	

Notes: * These cores, intended for the Superpave Regional Testing Center, will be collected at a later date when the testing procedures are finalized

The SPS-9A construction guidelines require consistency in layer thickness for each site The thickness of the surface layer should not deviate more than 10 mm from design.

Table 23(Cont.). Core Thickness from the Field Material Sampling and Testing Forms

	Before Section Stations 0-				After Section Stations 5+				Design
Section ID	**Station m**	**Offset m**	**Core #**	**Surface Thickness**	**Station m**	**Offset m**	**Core #**	**Surface Thickness**	**Surface Thickness**
Interval B 6 months									
090901	0-57 9	1 1	CA01B01	53	5+21.5	0.6	CA05B01	52*	63
	0-56.4	0.6	CA02B01	51*	5+23 0	1 1	CA06B01	60	(53-73)
	0-54 9	1.1	CA03B01	54	5+24.5	0.6	CA07B01	54	
	0-53.3	0.6	CA04B01	52*	5+26 0	1.1	CA08B01	60	
090902	0-50.5	1.1	CA01B02	65	5+21.5	0.6	CA05B02	66	63
	0-49.0	0.6	CA02B02	63	5+23 0	1.1	CA06B02	66	(53-73)
	0-47 5	1.1	CA03B02	64	5+24.5	0.6	CA07B02	68	
	0-46 0	0 6	CA04B02	61	5+26 0	1.1	CA08B02	67	
090903	0-50.5	1.1	CA01B03	55	5+21.5	0.6	CA05B03	58	63
	0-49.0	0 6	CA02B03	58	5+23 0	1 1	CA06B03	56	(53-73)
	0-47 5	1 1	CA03B03	55	5+24.5	0.6	CA07B03	57	
	0-46 0	0.6	CA04B03	56	5+26 0	1 1	CA08B03	55	
090960	0-50 5	1.1	CA01B60	59	5+21.5	0 6	CA05B60	58	63
	0-49 0	0.6	CA02B60	60	5+23.0	1.1	CA06B60	58	(53-73)
	0-47 5	1.1	CA03B60	61	5+24 5	0.6	CA07B60	58	
	0-46 0	0 6	CA04B60	61	5+26 0	1 1	CA08B60	59	
090961	0-50 5	1 1	CA01B61	61	5+21 5	0 6	CA05B61	56	63
	0-49 0	0 6	CA02B61	62	5+23.0	1.1	CA06B61	56	(53-73)
	0-47 5	1.1	CA03B61	61	5+24 5	0 6	CA07B61	58	
	0-46 0	0 6	CA04B61	61	5+26 0	1 1	CA08B61	57	
090962	0-50.5	1 1	CA01B62	57	5+21.5	0.6	CA05B62	55	63
	0-49 0	0 6	CA02B62	53	5+23 0	1 1	CA06B62	58	(53-73)
	0-47 5	1 1	CA03B62	54	5+24 5	0 6	CA07B62	55	
	0-46 0	0 6	CA04B62	54	5+26 0	1 1	CA08B62	59	

Notes * Did not meet the SPS-9A construction guidelines which require consistency in layer thickness for each site The thickness of the surface layer should not deviate more than 10 mm from design
At interval B (6 months after construction), the thickness of the surface layer was not measured in the field. Only the total thickness of the surface and leveling layers was measured for each core The surface layer measurements are from the CT lab sheets

Table 24. Summary of Surface Layer Average Thickness from Cores

Section ID	Int. A Cores Surface & Level. Thick.	Int. A Cores Surface Thickness	Diff. from Design (63mm)	Int. B Cores Surface & Level. Thick.	Int. B Cores Surface Thickness	Diff. from Design (63mm)
East Bound Overlay Construction Virgin Materials						
090901 (average 090902,03,60,61,62)	86 (89)	58 (60)	-5	116* (127)	55 (59)	-8
090902 (average 090901,03,60,61,62)	93* (86)	63 (59)	0	137* (122)	65 (57)	+2
090903 (average 090901,02,60,61,62)	85 (89)	58 (60)	-5	124 (125)	56 (59)	-7
West Bound Overlay Construction RAP Materials						
090960 (average 090901,02,03,61,62)	83 (89)	58 (60)	-5	123 (125)	59 (58)	-4
090961 (average 090901,02,03,60,62)	82* (89)	58 (60)	-5	128 (124)	59 (58)	-4
090962 (average 090901,02,03,60,61)	96* (87)	61 (60)	-2	121 (126)	56 (59)	-7

Thickness in millimeters

The SPS-9A construction guidelines require consistency in layer thickness for each site The thickness of the surface layer should not deviate more than 10 mm from design Also in the construction guidelines it is stated that "the as-compacted thickness of the asphalt concrete layer (surface plus binder course) in any test section shall be constructed to within ± 6 mm of the average value of the other test sections in the project"

* Indicates an asphalt concrete compacted thickness (surface plus leveling course) that exceed the allowable limit of ± 6 mm of the average value of the other test sections in the same project

At interval B in the field, the thickness of the surface layer was not measured Only the total thickness of the surface and leveling layers was measured for each core The surface layer measurements are from the CT lab sheets.

Table 25. Construction Data of Milled SPS-9A Sections

	090901	090902	090903	090960	090961	090962
Date Milled	29 May 97	03 Jun 97	04 Jun 97	01 May 97	16 May 97	09 Jun 97
Milled Depth (mm)	Inside edge/ Outside edge	Inside edge/ Outside edge	Inside edge/ Outside edge	Inside edge/ Outside edge	Inside edge/ Outside edge	Inside edge/ Outside edge
No. of meas.						
Maximum	21/21	23/21	21/21	21/21	21/21	21/21
Minimum	76/71	63/63	71/71	74/66	66/84	71/74
Std. Dev.	53/58	53/53	51/56	63/58	51/58	61/58
Average	0.3/0 1	0 1/0 1	0 2/0 1	0 1/0 1	0 2/0 3	0 1/0 2
	63/63	58/58	63/61	69/63	61/69	63/66
Hours Opened to Traffic	109 5	42	38	470	134	13 5
Dates and Times of Traffic on Milled Surface	29 May 97 @ 1700 till 03 Jun 97 @ 0630	03 Jun 97 @ 1700 till 05 Jun 97 @ 1100	04 Jun 97 @ 1700 till 06 Jun 97 @ 0700	01 May 97 @ 1700 till 21 May 97 @ 0700	16 May 97 @ 1700 till 22 May 97 @ 0700	09 Jun 97 @ 1700 till 10 Jun 97 @ 0630

Table 26. Field Samples Results of Quality Control Related Testing

Sampling Date: 23 Jun 97	Section ID: 090901	Mix: CT Class 1 Virgin

Test	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	TOL	JMF
Sample ID	BA01 A01	BA06 A01		DA01 A01	DA02 A01	DA03 A01	DA04 A01	DA05 A01	DA06 A01		
Time Plant Mixed	1049	1125		1049	1049	1049	1125	1125	1125		
Time Sampled	1138	1158		1138	1138	1138	1158	1158	1158		
Time Reheated				1250	1250	1250	1250	1250	1250		
Time Compacted @146°C				1407	1426	1501	1346	1356	1446		
Time Elapsed from sampling				2h29m	2h48m	3h23m	1h25m	1h32m	1h39m		
Time Elapsed from reheating				1h17m	1h36m	2h11m	0h56m	1h06m	1h56m		
Sieves mm											
19.0	100	99 9								6	95
12.5	96 4	98 3								6	92
9.5	79 7	81 6								6	74
4.75	54 0	55 7								6	55
2.36	41 3	42 4								6	44
1.18	32 7	33 9								4	-
0.600	26 3	27 2								4	27
0.300	18 9	19 4								3	17
0.150	10 4	10 3								3	-
0.075	4 4	4 3								2	5
%Pb	5 36	5 41								0 4	5 4
Gmm	2 471	2 475		2 471	2 471	2 471	2 475	2 475	2 475		
Gsb				2 625	2 625	2 625	2 625	2 625	2 625		
Gse				2 684	2 684	2 684	2 691	2 691	2 691		
Gmb@Nmax				2 420	2 419	2 426	2 414	2 401	2 403		
Gmb@Ndes				2 397	2 396	2 403	2 393	2 378	2 380		
Gb				1 03	1 03	1 03	1 03	1 03	1 03		
Pb				5 36	5 36	5 36	5 41	5 41	5 41		
Pba				0 86	0 86	0 86	0 96	0 96	0 96		
Pbe				4 55	4 55	4 55	4 50	4 50	4 50		
Height @Nini				123 9	124 3	123 5	124 3	124 9	125 0		
Height @Ndes				115 0	115 4	114 4	115 5	116 4	116 3		
Height @Nmax				113 9	114 3	113 3	114 5	115 3	115 2		
Density @Nini				90 0*	90 0*	90 1*	89 8*	89 7*	89 6*	89 max	
Density @Ndes				97 0	97 0	97 2	96 7	96 2	96 2	94 8-97 2	
Density @Nmax				97 9	97 9	98 2*	97 5	97 2	97 2	98 max	
VA				3 0	3 0	2 8	3 3	3 8	3 8	2 8-5 2	
VMA				13 6*	13 6*	13 4*	13 8*	14 3	14 2	14 min	
VFA				78 0	77 7	79 4*	76 0	72 7	73 0	65-78	
0.075 mm /Pbe				1 0	1 0	1 0	1 0	1 0	1 0	0 6-1 2	

* Outside the allowable tolerance range TOL (tolerance), JMF (Job Mix Formula)

Table 26(contd.). Field Samples Results of Quality Control Related Testing

Sampling Date: 15 Jul 97	Section ID: 090902	Mix: Superpave Virgin

Test	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	TOL	JMF
Sample ID	BA05 A02	BA06 A02	BA34 A02	DA02 A02	DA03 A02	DA04 A02	DA31 A02	DA32 A02	DA33 A02		
Time Plant Mixed											
Time Sampled	1040	1040	1100	1040	1040	1040	1100	1100	1100		
Time Reheated											
Time Compacted @146°C				1223	1233	1242	1303	1311	1318		
Time Elapsed from sampling				1h43m	1h53m	2h02m	2h03m	2h11m	2h18m		
Time Elapsed from reheating											
Sieves mm											
19.0	100	100	100							6	100
12.5	97	97	97							6	97
9.5	77	82	80							6	82
4.75	53	57	54							6	56
2.36	39	42	40							6	42
1.18	30	31	30							4	32
0.600	23	24	24							4	25
0.300	17	17	16							3	17
0.150	9	9	8							3	9
0.075	3 4	3 6	3 0							2	4
%Pb	4 94	5 49	5 36							0 4	5 0
Gmm	2 459	2 478	2 446	2 459	2 459	2 459	2 446	2 446	2 446		
Gsb	2 625	2 625	2 625	2 625	2 625	2 625	2 625	2 625	2 625		
Gse				2 650	2 650	2 650	2 653	2 653	2 653		
Gmb@Nmax				2 398	2 398	2 400	2 391	2 383	2 390		
Gmb@Ndes				2 373	2 353	2 375	2 364	2 359	2 366		
Gb				1 03	1 03	1 03	1 03	1 03	1 03		
Pb				4 94	4 94	4 94	5 36	5 36	5 36		
Pba				0 37	0 37	0 37	0 41	0 41	0 41		
Pbe				4 59	4 59	4 59	4 97	4 97	4 97		
Height @Nini				126 1	126 3	125 4	126 7	126 4	125 9		
Height @Ndes				117 0	117 9	116 4	117 2	117 4	117 1		
Height @Nmax				115 8	115 7	115 2	115 9	116 2	115 9		
Density @Nini				89 6*	89 3*	89 7*	89 4*	89 6*	89 9*	89 max	
Density @Ndes				96 5	95 7	96 6	96 7	96 4	96 7	94 8-97 2	
Density @Nmax				97 5	97 5	97 6	97 8	97 4	97 7	98 max	
VA				3 5	4 3	3 4	3 3	3 6	3 3	2 8-5 2	
VMA				14 1	14 8	14 0	14 8	14 1	14 7	14 min	
VFA				75 1	70 9	75 6	77 3	74 7	77 8	65-78	
0.075 mm /Pbe				0 7	0 7	0 7	0 6	0 6	0 6	0 6-1 2	

* Outside the allowable tolerance range TOL (tolerance), JMF (Job Mix Formula)

Table 26(contd.). Field Samples Results of Quality Control Related Testing

Sampling Date: 28 Jun 97	Section ID: 090903	Mix: Superpave Alt Virgin

Test	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	TOL	JMF
Sample ID	BA01 A03	BA06 A03		DA01 A03	DA02 A03	DA03 A03	DA04 A03	DA05 A03	DA06 A03		
Time Plant Mixed	0928	0938		0928	0928	0928	0938	0938	0938		
Time Sampled	1032	1046		1032	1032	1032	1046	1046	1046		
Time Reheated											
Time Compacted @146°C				1332	1346	1353	1144	1152	1203		
Time Elapsed from sampling				3h00m	3h14m	3h21m	0h58m	1h06m	1h17m		
Time Elapsed from reheating											
Sieves mm											
19.0	100	100								6	100
12.5	98 3	98 5								6	97
9.5	83 4	83 3								6	82
4.75	58 3	57 8								6	56
2.36	44 7	42 5								6	42
1.18	34 7	31 9								4	32
0.600	27 9	24 7								4	25
0.300	20 4	17 0								3	17
0.150	11 3	8 6								3	9
0.075	5 3	3 4								2	4
%Pb	5 40	5 24								0 4	5 4
Gmm	2 473	2 474		2 473	2 473	2 473	2 474	2 474	2 474		
Gsb				2 625	2 625	2 625	2 625	2 625	2 625		
Gse				2 688	2 688	2 688	2 681	2 681	2 681		
Gmb@Nmax				2 421	2 425	2 421	2 413	2 411	2 409		
Gmb@Ndes				2 398	2 402	2 398	2 388	2 386	2 384		
Gb				1 03	1 03	1 03	1 03	1 03	1 03		
Pb				5 40	5 40	5 40	5 24	5 24	5 24		
Pba				0 92	0 92	0 92	0 82	0 82	0 82		
Pbe				4 53	4 53	4 53	4 46	4 46	4 46		
Height @Nini				124 5	124 5	124 6	125 4	125 1	125 3		
Height @Ndes				115 8	115 7	115 6	116 1	116 0	116 4		
Height @Nmax				114 7	114 6	114 5	114 9	114 8	115 2		
Density @Nini				90 2*	90 3*	90 2*	89 3*	89 5*	89 5*	89 max	
Density @Ndes				97 0	97 1	97 0	96 5	96 5	96 4	94 8-97 2	
Density @Nmax				97 9	98 1*	97 9	97 5	97 5	97 4	98 max	
VA				3 0	2 9	3 0	3 5	3 5	3 6	2 8-5 2	
VMA				13 6*	13 4*	13 6*	13 8*	13 9*	13 9*	14 min	
VFA				77 7	78 7*	77 7	74 8	74 3	73 9	65-78	
0.075 mm /Pbe				1 2	1 2	1 2	0 8	0 8	0 8	0 6-1 2	

* Outside the allowable tolerance range TOL (tolerance), JMF (Job Mix Formula)

Table 26(contd.). Field Samples Results of Quality Control Related Testing

Sampling Date: 07 Aug 97	Section ID: 090960	Mix: CT Class 1 RAP

Test	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	TOL	JMF
Sample ID	BA01 A60	BA06 A60		DA01 A60	DA02 A60	DA03 A60	DA04 A60	DA05 A60	DA06 A60		
Time Plant Mixed											
Time Sampled	1044	1103		1044	1044	1044	1103	1103	1103		
Time Reheated											
Time Compacted @146°C				1255	1303	1331	1228	1235	1242		
Time Elapsed from sampling				2h11m	2h19m	2h47m	1h25m	1h32m	1h39m		
Time Elapsed from reheating											
Sieves mm											
19.0	99 8	100								6	95
12.5	95 5	96 2								6	92
9.5	74 5	74 5								6	74
4.75	48 3	47 7								6	53
2.36	38 8	38 0								6	41
1.18	31 4	30 6								4	-
0.600	25 2	24 5								4	27
0.300	17 4	17 0								3	17
0.150	8 4	8 4								3	-
0.075	3 3	3 4								2	5
%Pb	5 19	4 85								0 4	5 0
Gmm	2 503	2 506		2 503	2 503	2 503	2 506	2 506	2 506		
Gsb				2 690	2 690	2 690	2 690	2 690	2 690		
Gse				2 716	2 716	2 716	2 703	2 703	2 703		
Gmb@Nmax				2 461	2 459	2 457	2 451	2 454	2 451		
Gmb@Ndes				2 438	2 438	2 436	2 428	2 433	2 430		
Gb				1 03	1 03	1 03	1 03	1 03	1 03		
Pb				5 19	5 19	5 19	4 85	4 85	4 85		
Pba				0 37	0 37	0 37	0 18	0 18	0 18		
Pbe				4 84	4 84	4 84	4 68	4 68	4 68		
Height @Nini				123 4	123 3	123 3	123 3	123 1	124 2		
Height @Ndes				115 3	115 3	115 3	115 3	115 2	116 1		
Height @Nmax				114 2	114 3	114 3	114 2	114 2	115 1		
Density @Nini				91 0*	91 1*	91 0*	90 6*	90 8*	90 6*	89 max	
Density @Ndes				97 4*	97 4*	97 3*	96 9	97 1	97 0	94 8-97 2	
Density @Nmax				98 3*	98 2*	98 2*	97 8	97 9	97 8	98 max	
VA				2 6*	2 6*	2 7*	3 1	2 9	3 0	2 8-5 2	
VMA				13 3*	14 1	14 1	14 1	13 9*	14 1	14 min	
VFA				80 5*	81 5*	81 1*	78 0	79 1*	78 4*	65-78	
0.075 mm /Pbe				0 7	0 7	0 7	0 7	0 7	0 7	0 6-1 2	

* Outside the allowable tolerance range TOL (tolerance), JMF (Job Mix Formula)

Table 26(contd.). Field Samples Results of Quality Control Related Testing

Sampling Date: 08 Sep 97	Section ID: 090961	Mix: Superpave RAP

Test	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	TOL	JMF
Sample ID	BA01 A61	BA06 A61		DA01 A61	DA02 A61	DA03 A61	DA04 A61	DA05 A61	DA06 A61		
Time Plant Mixed											
Time Sampled											
Time Reheated											
Time Compacted @146°C											
Time Elapsed from sampling											
Time Elapsed from reheating											
Sieves mm											
19.0	100	99 9								6	100
12.5	96 6	95 9								6	97
9.5	83 6	79 4								6	77
4.75	47 9	47 1								6	45
2.36	32 9	30 9								6	31
1.18	24 9	22 3								4	25
0.600	20 0	17 4								4	19
0.300	14 8	12 4								3	13
0.150	8 7	6 9								3	7
0.075	4 2	3 2								2	3
%Pb	4 78	4 77								0 4	5 0
Gmm	2 511	2 496		2 511	2 511	2 511	2 496	2 496	2 496		
Gsb				2 665	2 665	2 665	2 665	2 665	2 665		
Gse				2 712	2 712	2 712	2 693	2 693	2 693		
Gmb@Nmax				2 419	2 422	2 422	2 400	2 411	2 417		
Gmb@Ndes				2 388	2 389	2 391	2 366	2 378	2 384		
Gb				1 014	1 014	1 014	1 014	1 014	1 014		
Pb				4 78	4 78	4 78	4 77	4 77	4 77		
Pba				0 66	0 66	0 66	0 73	0 73	0 73		
Pbe				4 15	4 15	4 15	4 39	4 39	4 39		
Height @Nini				129 5	129 3	128 7	131 6	130 3	129 6		
Height @Ndes				118 2	118 0	117 7	119 1	118 1	117 5		
Height @Nmax				116 7	116 4	116 2	117 4	116 5	115 9		
Density @Nini				86 8	86 8	87 1	85 8	86 2	86 6	89 max	
Density @Ndes				95 1	95 1	95 2	94 8	95 3	95 5	94 8-97 2	
Density @Nmax				96 3	96 5	96 5	96 2	96 6	96 8	98 max	
VA				4 9	4 9	4 8	5 2	4 7	4 5	2 8-5 2	
VMA				14 7	14 6	14 6	15 5	15 0	14 8	14 min	
VFA				66 6	66 8	67 2	66 3	68 5	69 7	65-78	
0.075 mm /Pbe				1 0	1 0	1 0	0 7	0 7	0 7	0 6-1 2	

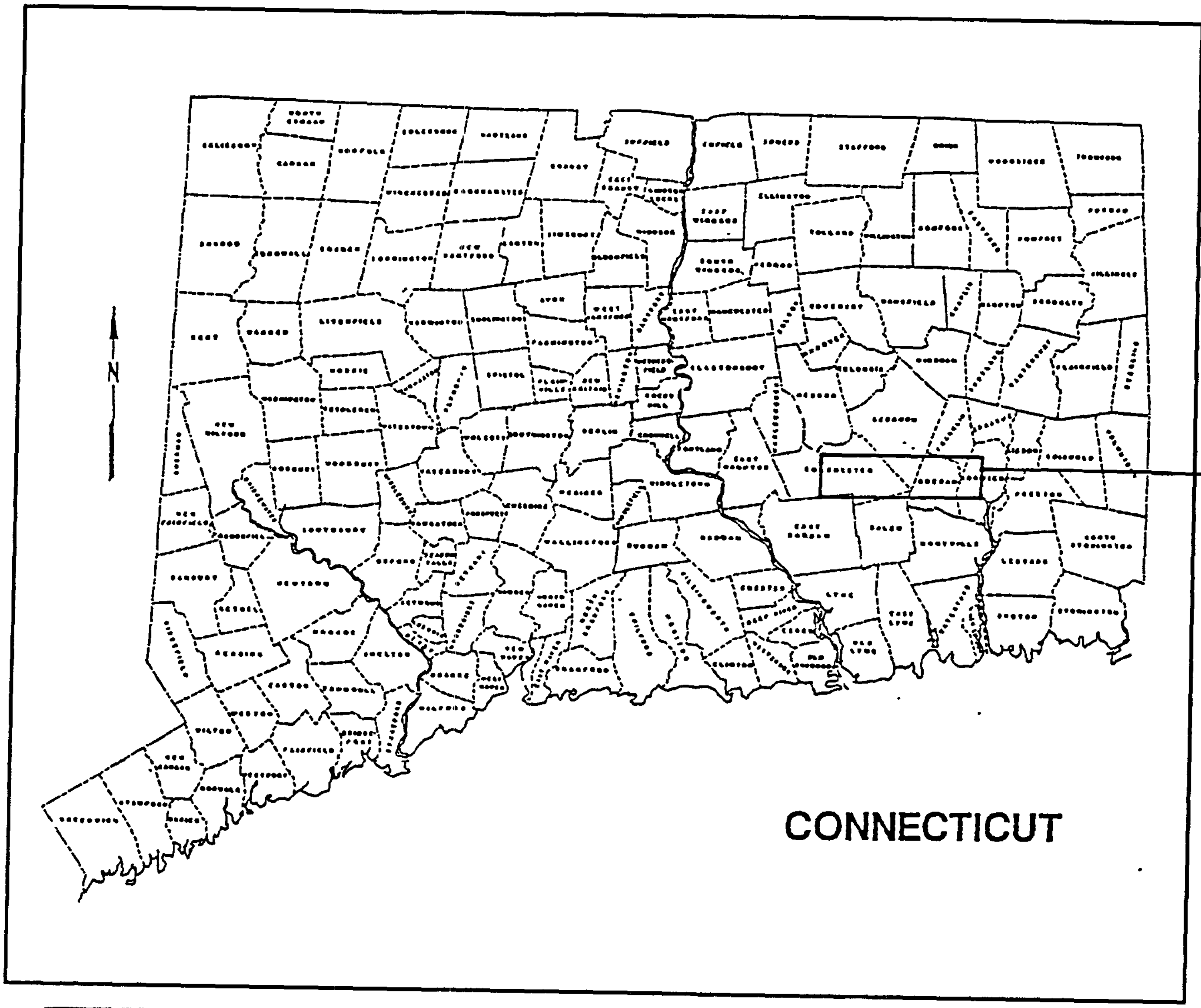
* Outside the allowable tolerance range. TOL (tolerance), JMF (Job Mix Formula).

Table 26(contd.). Field Samples Results of Quality Control Related Testing

Sampling Date: 12 Aug 97	Section ID: 090962	Mix: Superpave Alt. RAP

Test	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	TOL	JMF
Sample ID	BA01 A62	BA06 A62		DA01 A62	DA02 A62	DA03 A62	DA04 A62	DA05 A62	DA06 A62		
Time Plant Mixed											
Time Sampled											
Time Reheated											
Time Compacted @146°C				1259	1306	1314					
Time Elapsed from sampling											
Time Elapsed from reheating											
Sieves mm											
19.0	100	100								6	100
12.5	99 0	97 2								6	97
9.5	82 4	83 5								6	77
4.75	45 4	43 6								6	45
2.36	31 3	29 7								6	31
1.18	24 0	22 7								4	25
0.600	19 1	18 2								4	19
0.300	13 3	13 3								3	13
0.150	7 2	7 5								3	7
0.075	3 2	3 5								2	3
%Pb	4 96	5 03								0 4	5 0
Gmm	2 514	2 514		2 514	2 514	2 514	2 514	2 514	2 514		
Gsb				2 691	2 691	2 691	2 691	2 691	2 691		
Gse				2 721	2 721	2 721	2 724	2 724	2 724		
Gmb@Nmax				2 430	2 430	2 443	2 427	2 421	2 421		
Gmb@Ndes				2 399	2 397	2 399	2 394	2 389	2 389		
Gb				1 024	1 024	1 024	1 024	1 024	1 024		
Pb				4 96	4 96	4 96	5 03	5 03	5 03		
Pba				0 42	0 42	0 42	0 46	0 46	0 46		
Pbe				4 56	4 56	4 56	4 59	4 59	4 59		
Height @Nini				130 4	130 3	124 9	129 7	131 0	130 9		
Height @Ndes				118 6	118 7	117 6	118 1	119 1	119 0		
Height @Nmax				117 1	117 1	116 1	116 5	117 5	117 4		
Density @Nini				86 8	86 9	90 3*	86 7	86 4	86 4	89 max	
Density @Ndes				95 4	95 3	95 4	95 2	95 0	95 0	94 8-97 2	
Density @Nmax				96 7	96 7	97 2	96 5	96 3	96 3	98 max	
VA				4 6	4 7	4 6	4 8	5 0	5 0	2 8-5 2	
VMA				15 3	15 3	15 3	15 5	15 7	15 7	14 min	
VFA				70 1	69 7	70 1	69 2	68 3	68 3	65-78	
0.075 mm /Pbe				0 7	0 7	0 7	0 8	0 8	0 8	0 6-1 2	

* Outside the allowable tolerance range. TOL (tolerance), JMF (Job Mix Formula).



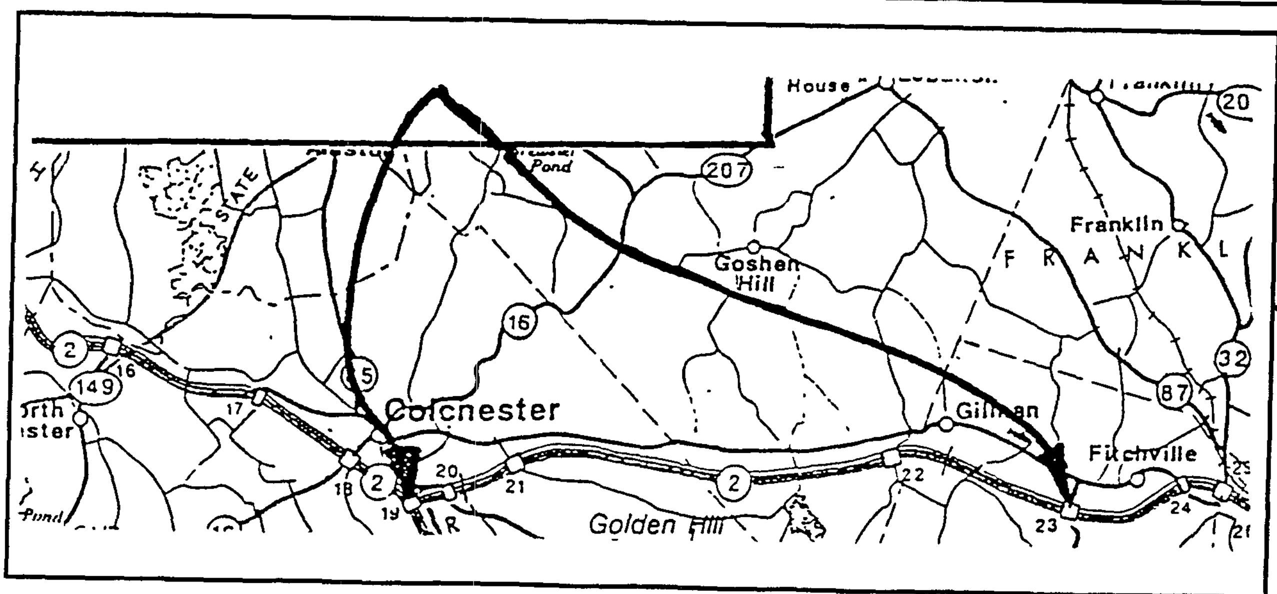
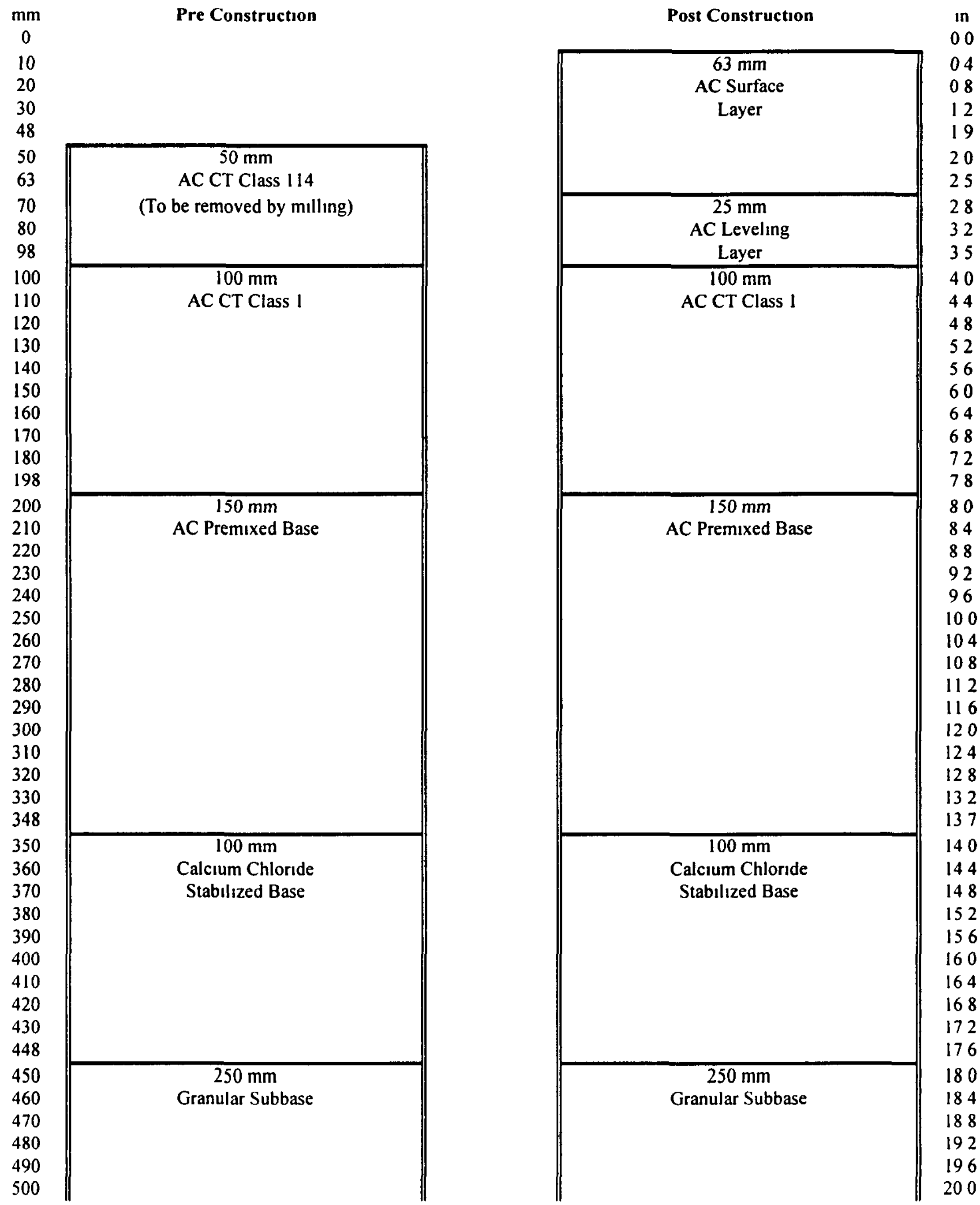


Figure 1. Site Location Maps - CT SPS-9A Project 090900



Note Not to scale

Figure 2. Pavement Structure Before and After Construction

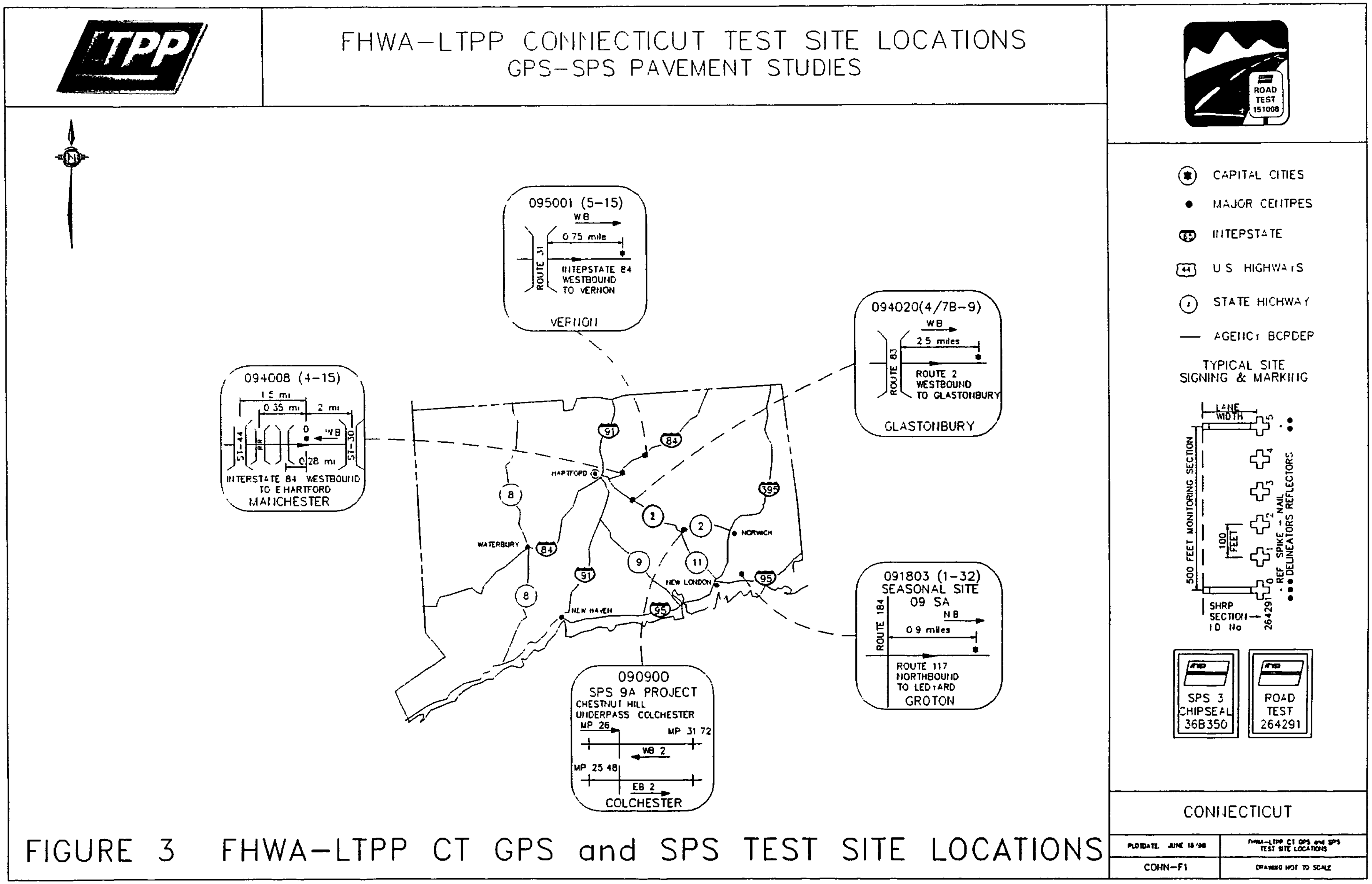
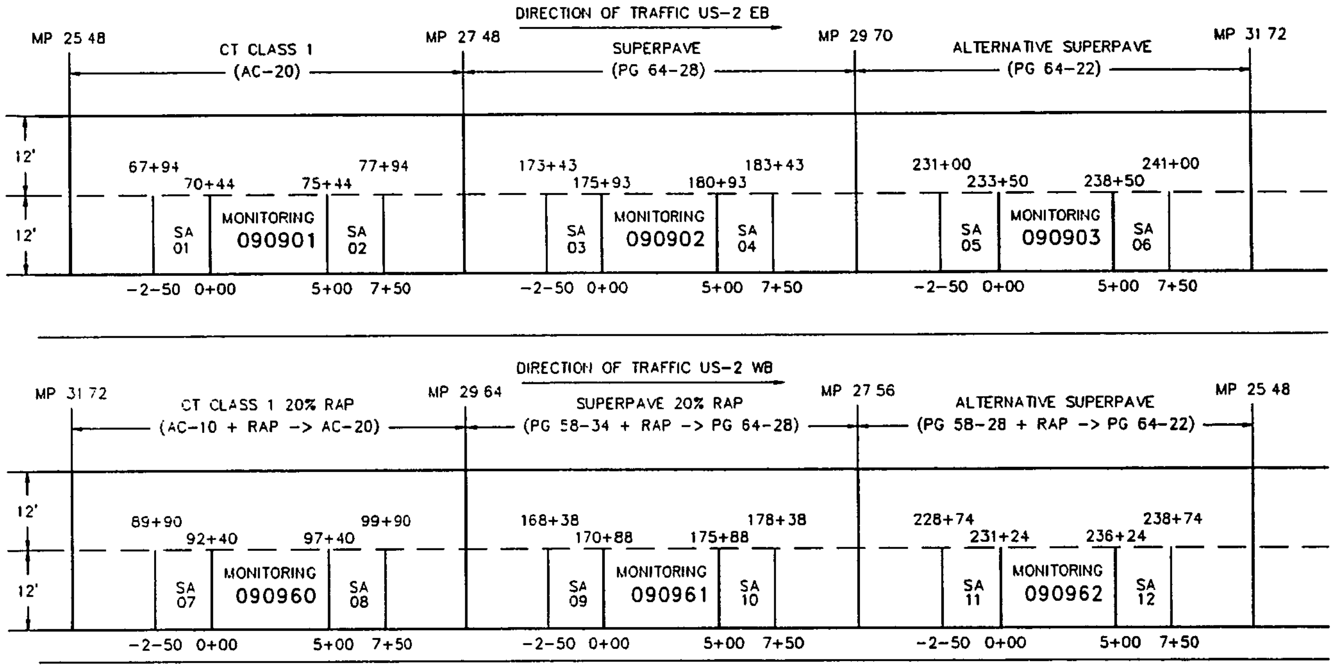


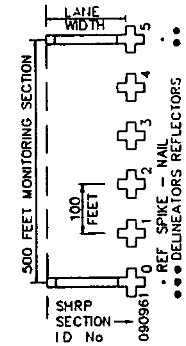
FIGURE 3 FHWA-LTPP CT GPS and SPS TEST SITE LOCATIONS

FHWA-LTPP SPS-9A SR2, COLCHESTER,CT. DESIGN SCHEMATIC

VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS



TYPICAL SITE SIGNING & MARKING



LAYER No	LAYER THICKNESS	MATERIAL DESCRIPTION	MATERIAL CODE	LAYER CODE
8	2 1/2"	NEW AC WEARING - CLASS 1	01	H
7	1"	NEW AC LEVELING - CLASS 2	01	G
6	2" *	EXISITNIG AC WEARING - CLASS 114	01	F
5	4"	EXISTING AC BINDER - CLASS 1	01	E
4	6"	ASPHALT TREATED BASE	319	D
3	4"	CALCIUM STABLIZED GRANULAR BASE	304	C
2	10"	GRANULAR SUBBASE / LMBANKMENT (SELECT BORROW)	302	B
1	N/A	SUBGRADE - POORLY GRADED SAND	205	A

* EXISTING 2" (50 8 mm) AC WEARING COURSE WILL BE MILLED OFF AND REPLACED WITH A 1" (25 4 mm) LEVELING COURSE - CLASS 2 AND 2 5" (63 5 mm) AC WEARING COURSE - CLASS 1

FIGURE 4 LAYOUT OF SPS-9A TEST SECTIONS

LAYOUT OF TEST SECTIONS HIGHWAY 2 EAST and WEST BOUND

CT DOT SPS-9A
SR 2 EB/WB, COLCHESTER, CT

PLOTDATE JUNE 18/98 | SPS-9-COL

FHWA SPS-9A TEST SECTIONS ONLY DIMENSIONAL DETAILS ONLY DRAWING NOT TO SCALE

C:\CAD_DWGS\CONN2\SPS9-COL

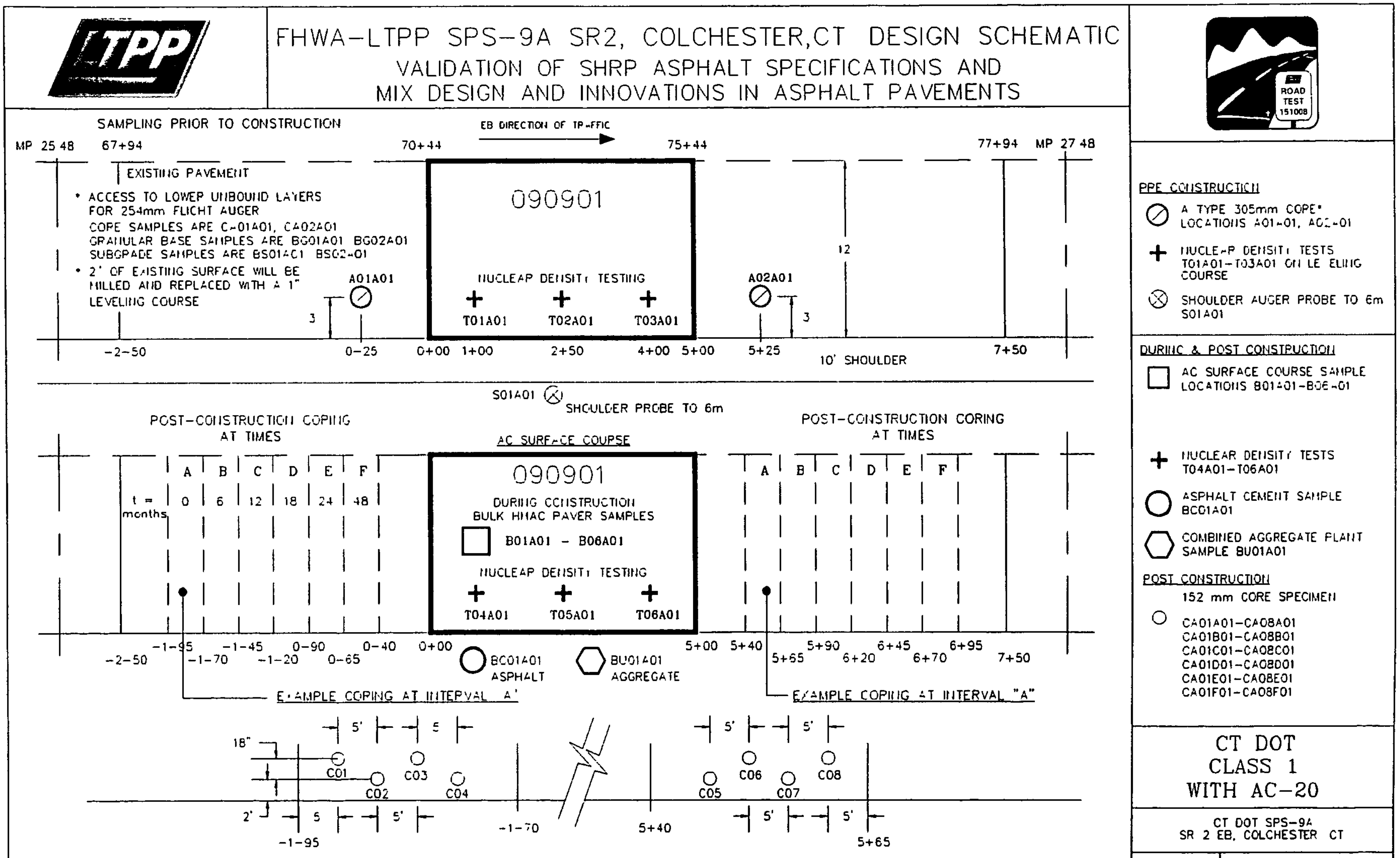


FIGURE 5-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 090901

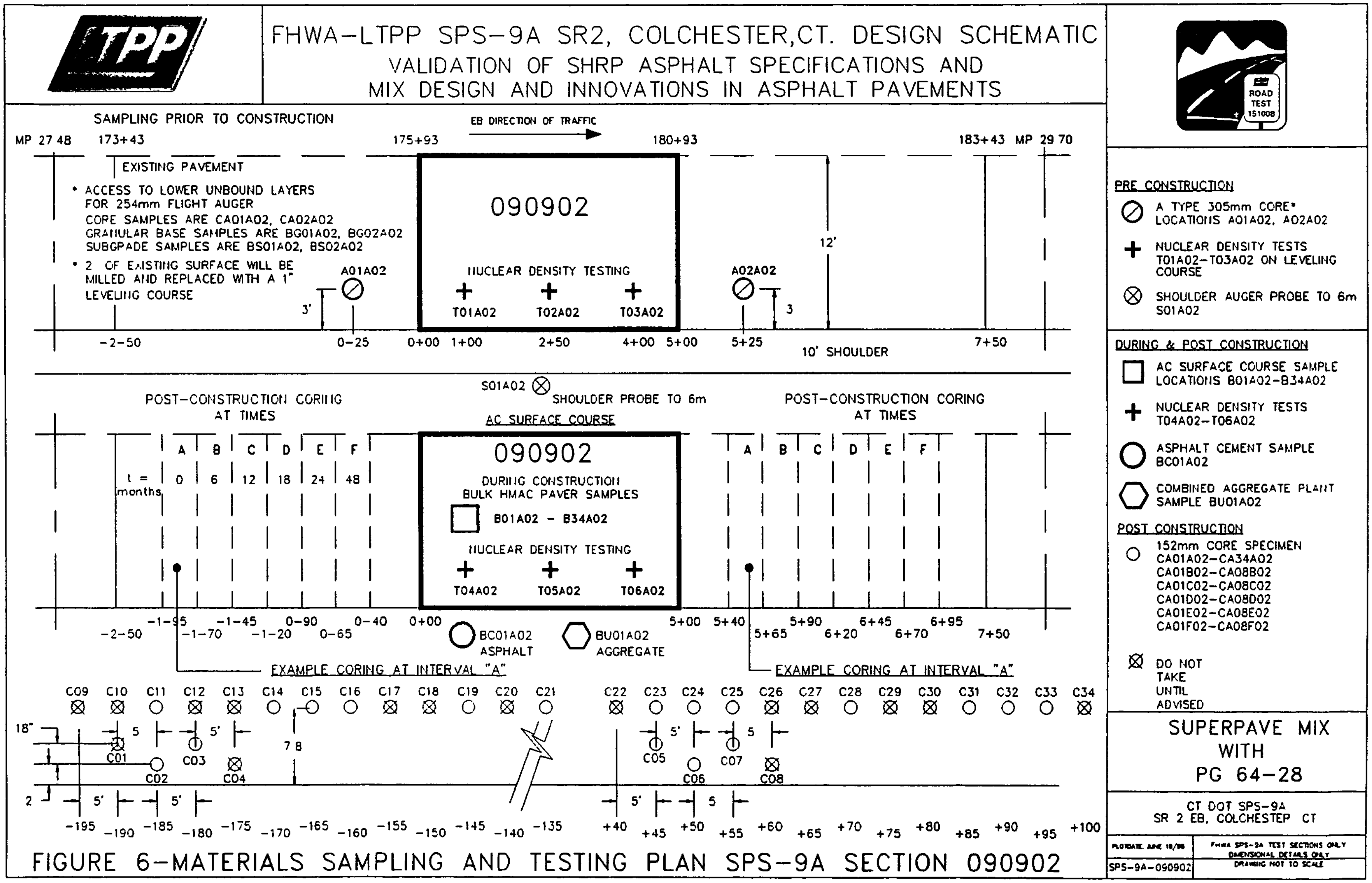


FIGURE 6-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 090902

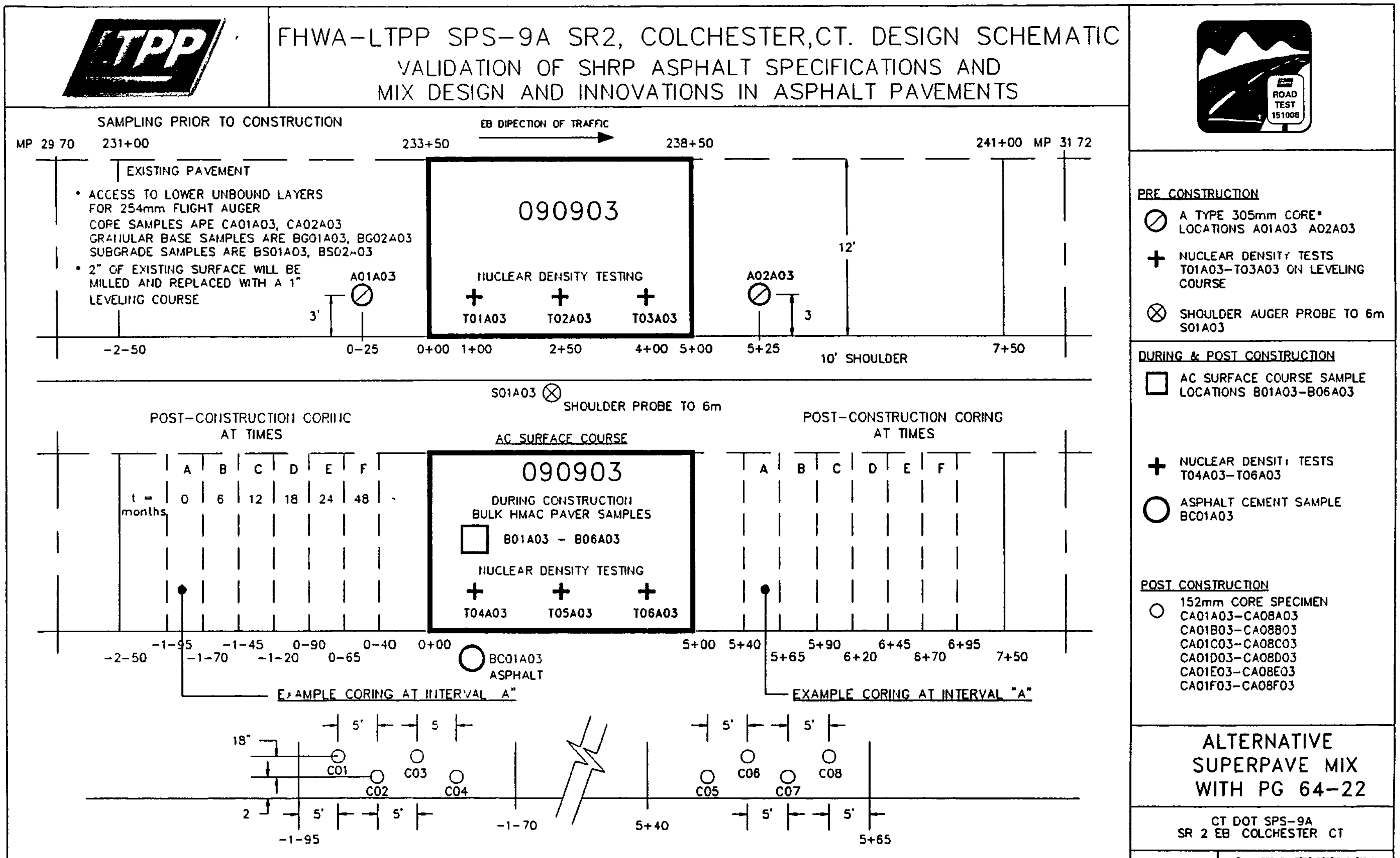


FIGURE 7-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 090903

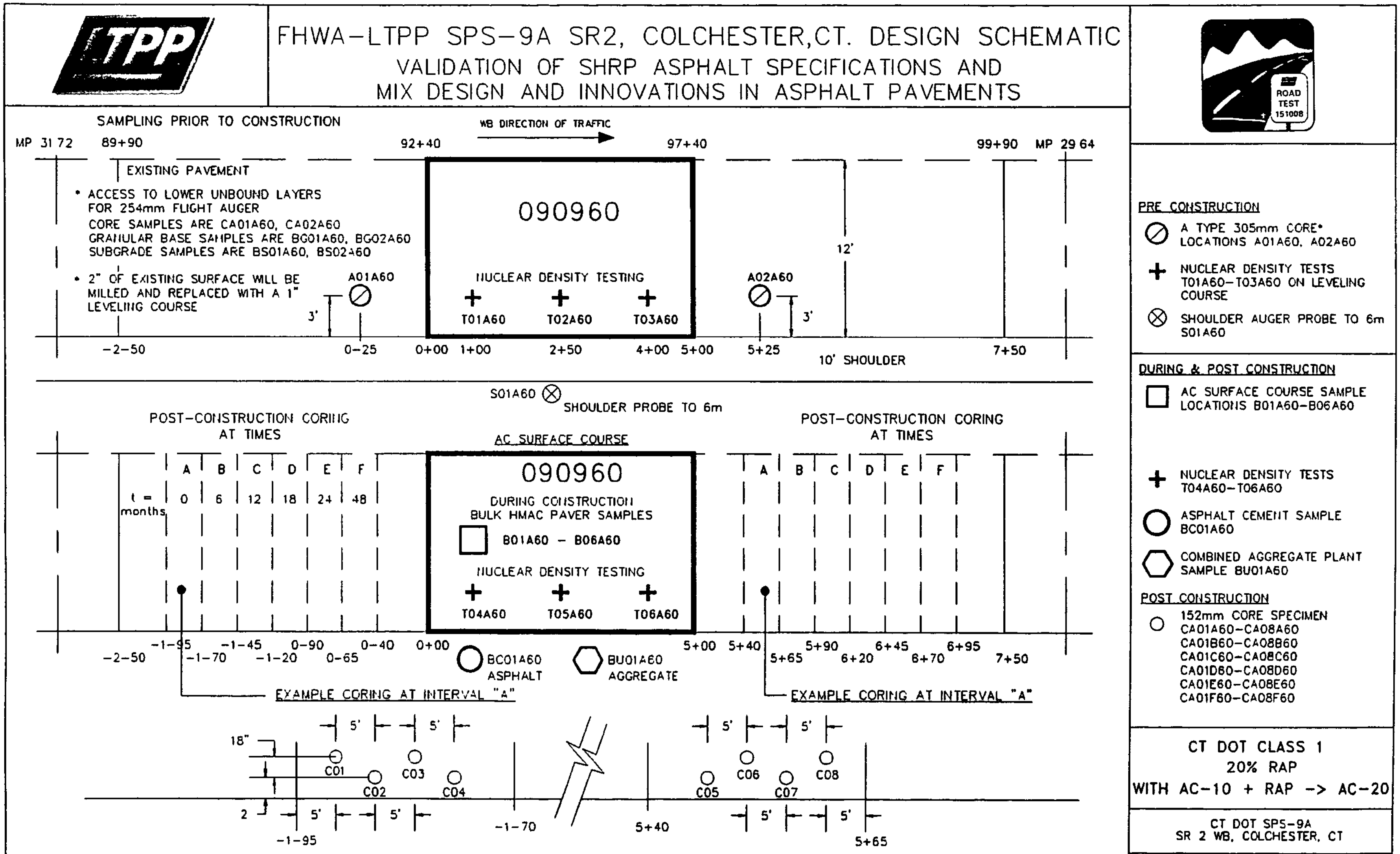


FIGURE 8-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 090960

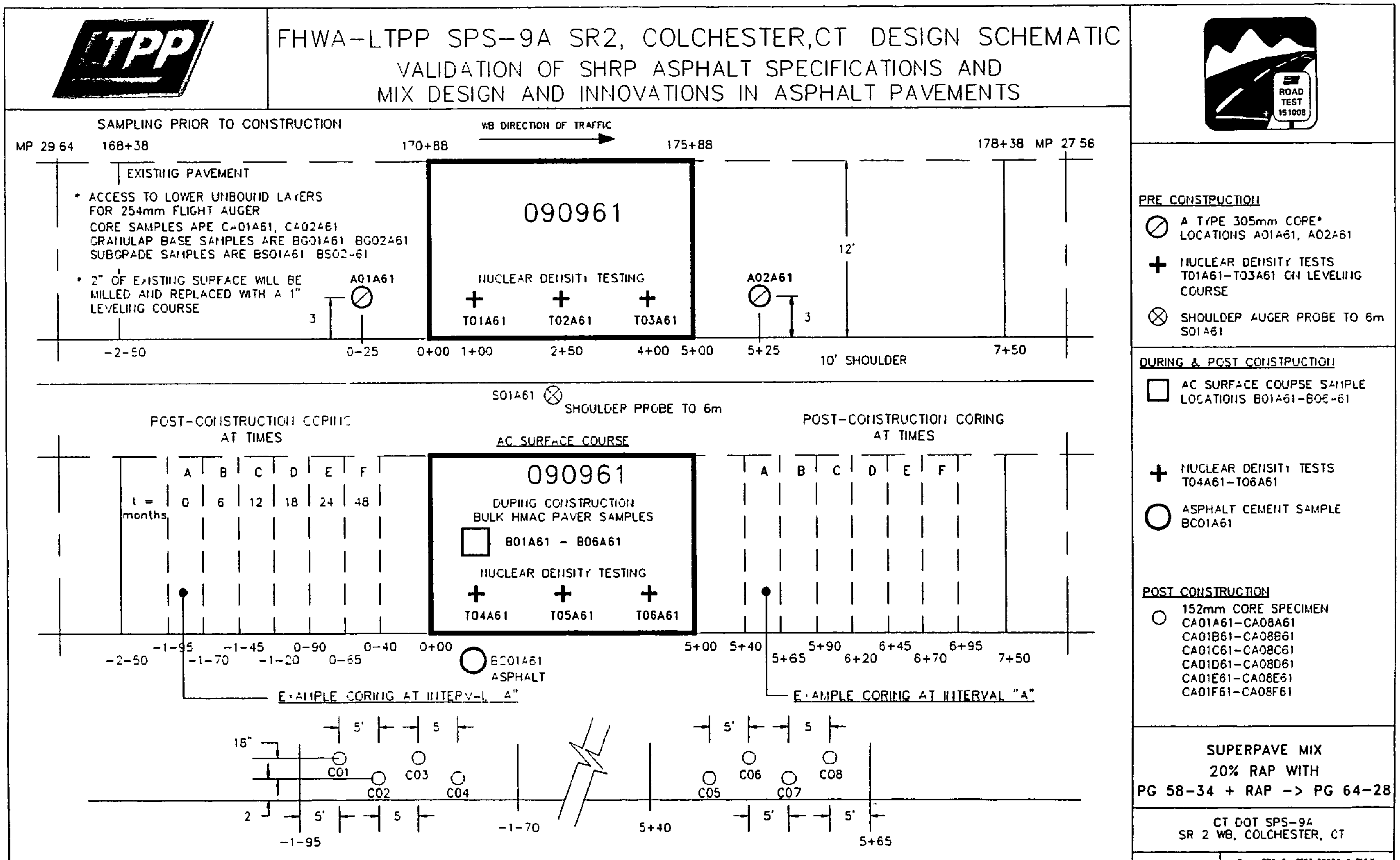


FIGURE 9-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 090961

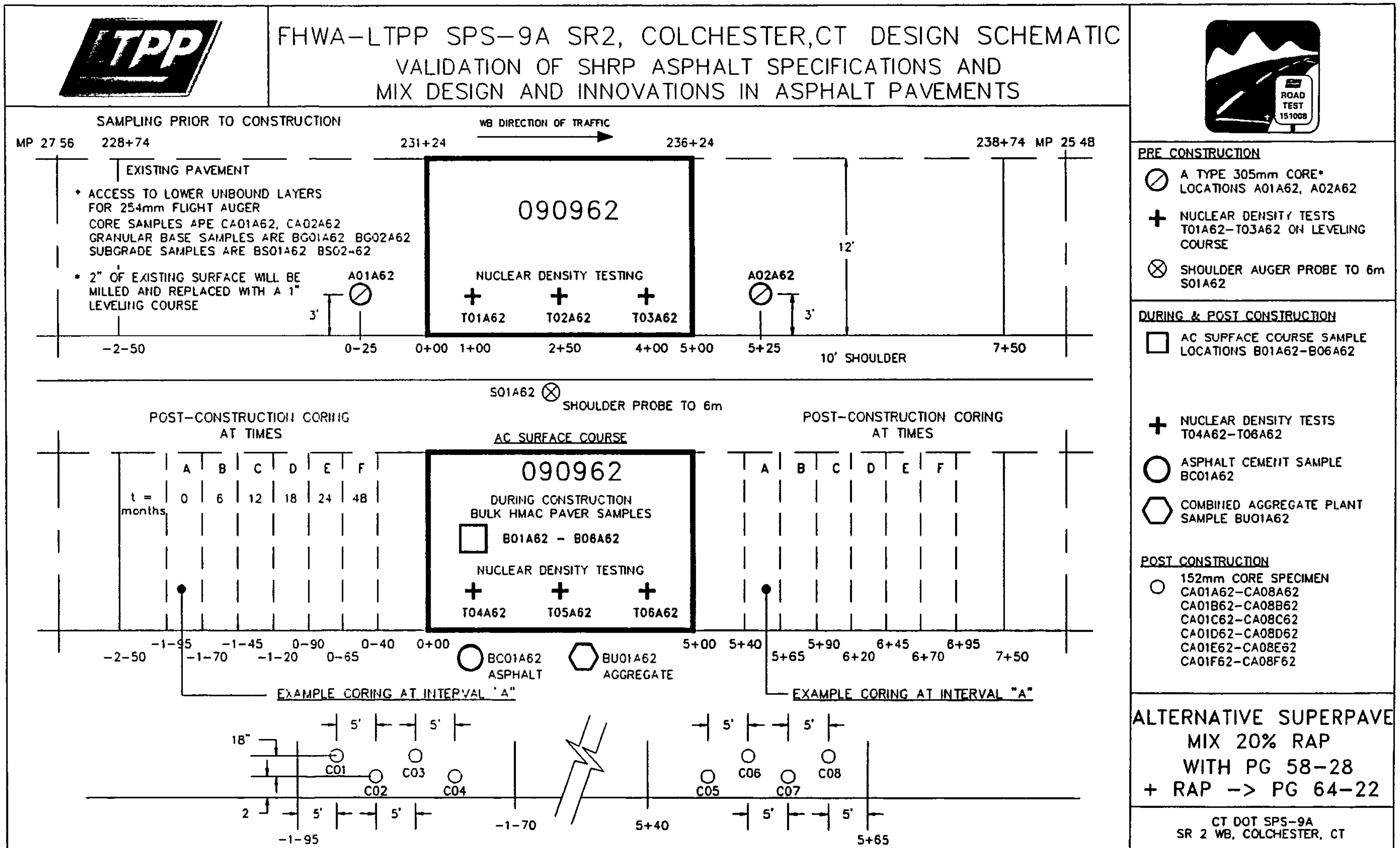


FIGURE 10—MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 090962

	090962		**090961**		**090960**	
	236+24 231+24		175+88 170+88		97+40 92+40	Const Stations
WB Outside	5+00 0+00		5+00 0+00		5+00 0+00	Exper Stations
Shoulder	1101 1036		1225 1203		1108 1041	SPS Pav Time
Thickness Type of Pavement **<Bulk Samples**	63 mm RAP Superpave™ Alt With PG 58-28 BA01A62-BA06A62	**8/12** ←	63 mm RAP Superpave™ With PG 58-34 BA01A61-BA06A61	**9/08** ←	63 mm RAP CT Class 1 With AC-10 BA01A60-BA06A60	SPS WB lane ← **Aug.07** Paving Date
non SPS WB lane			←═════		Route 2 West Bound Traffic Direction	
WB Inside **Shoulder**						
CL						
EB Inside **Shoulder**	**090901**		**090902**		**090903**	
non SPS EB lane	Route 2 East Bound Traffic Direction		═════→			
SPS EB lane **Jun.23 →** Paving Date	63 mm CT Class 1 With AC-20 BA01A01-BA06A01	**7/15** →	63 mm Superpave™ With PG 64-28 BA01A02-BA34A02	**6/28** →	63 mm Superpave™ Alt With PG 64-22 BA01A03-BA06A03	Thickness Type of Pavement **<Bulk Samples**
EB Outside	1136 1202		1054 1131		1028 1054	SPS Pav Time
Shoulder	0+00 5+00		0+00 5+00		0+00 5+00	Exper Stations
	70+44 75+44		175+93 180+93		233+50 238+50	Const Stations

Not to scale

CL - Center Line

Refer to Table 21 for more details on the paving of the leveling and surface layers

Figure 11. Surface Layer Type, Paving Dates, Paving Times, and Bulk Sample Locations

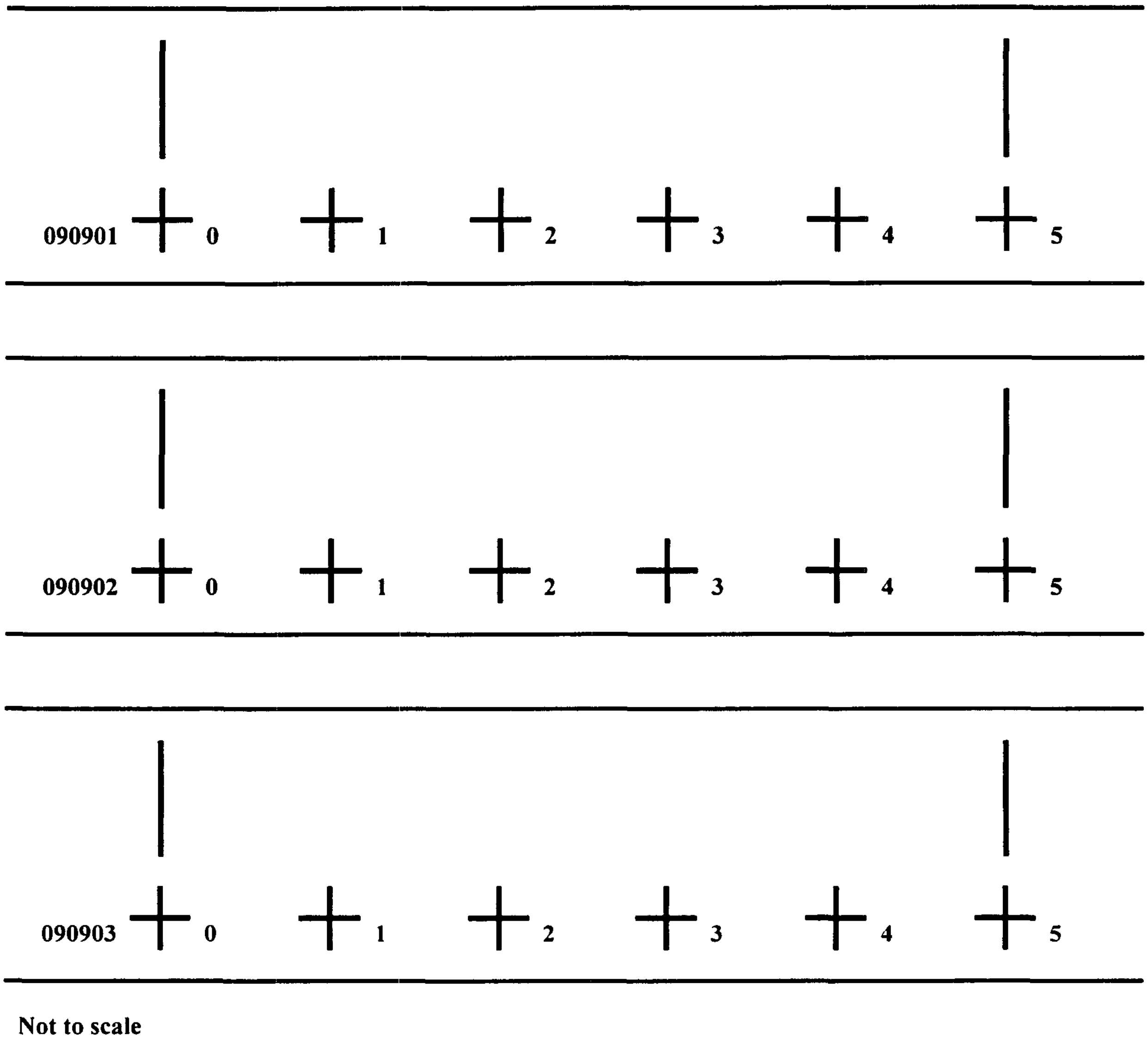


Figure 12. Route 2 East Bound SPS-9A Virgin Test Sections Site Marking Plan After Construction

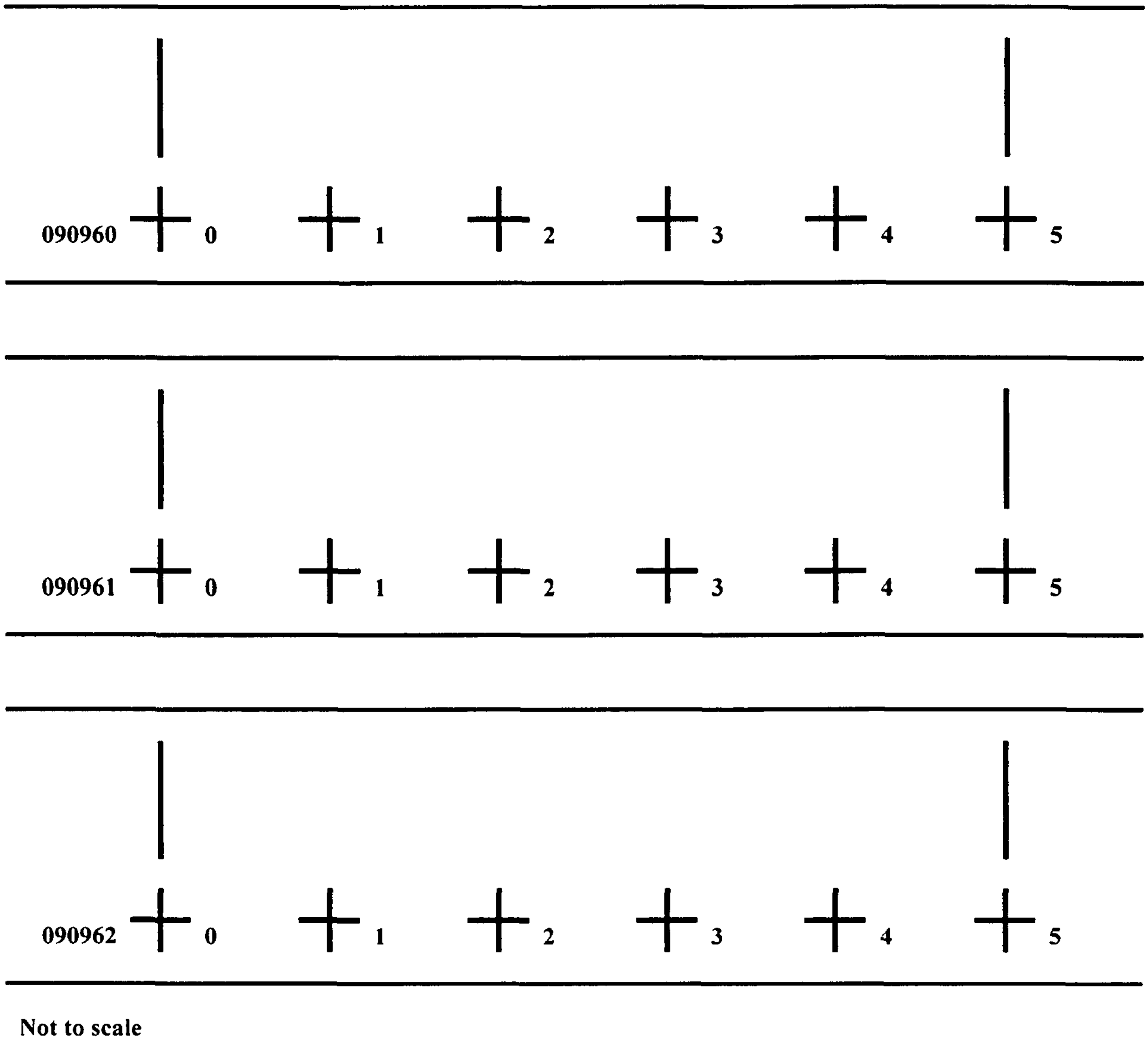


Figure 13. Route 2 West Bound SPS-9A RAP Test Sections Site Marking Plan After Construction

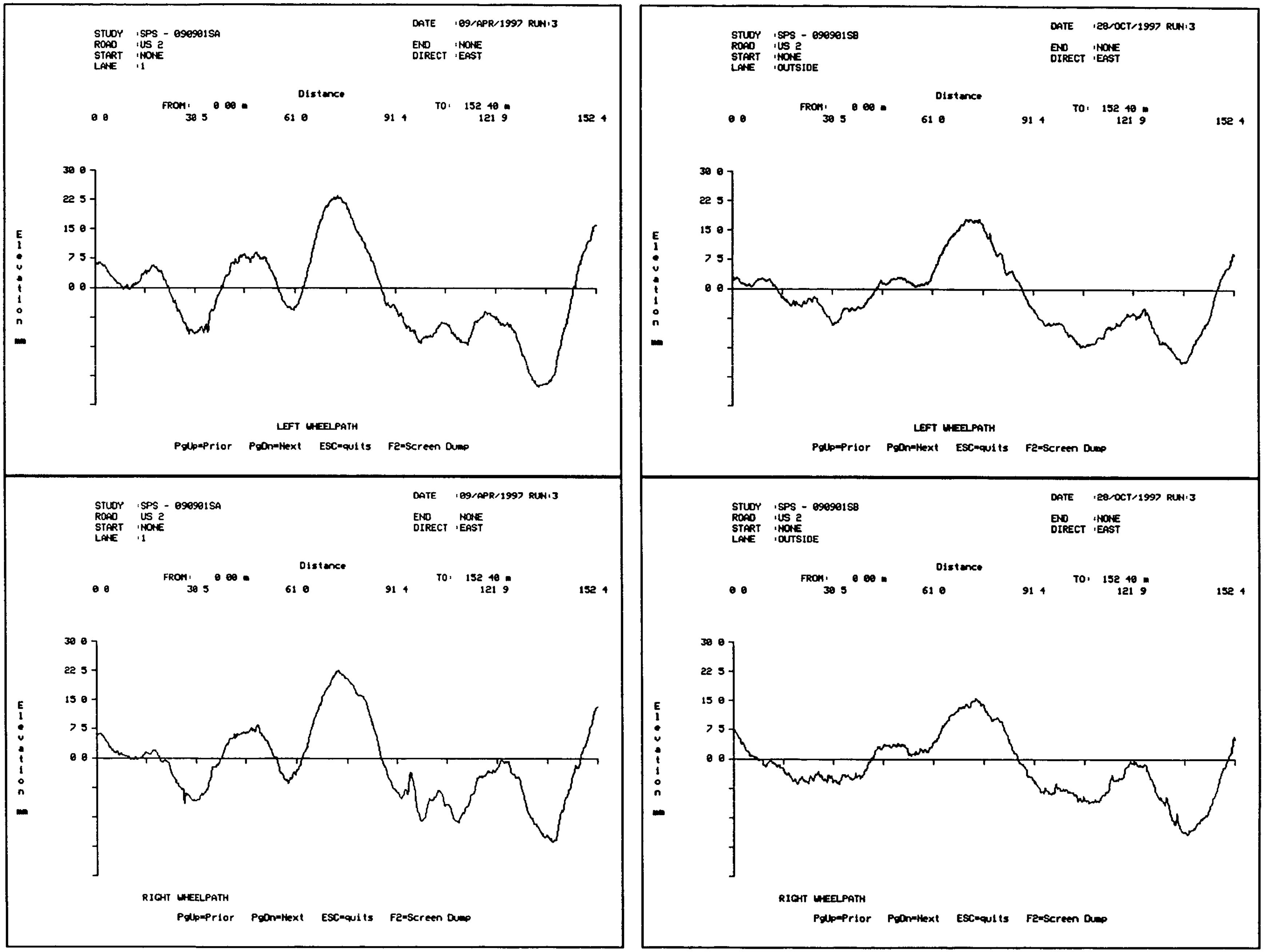


Figure 14 Profile Measurements, Section 090901, Before and After Construction, as Collected with the Profilometer™

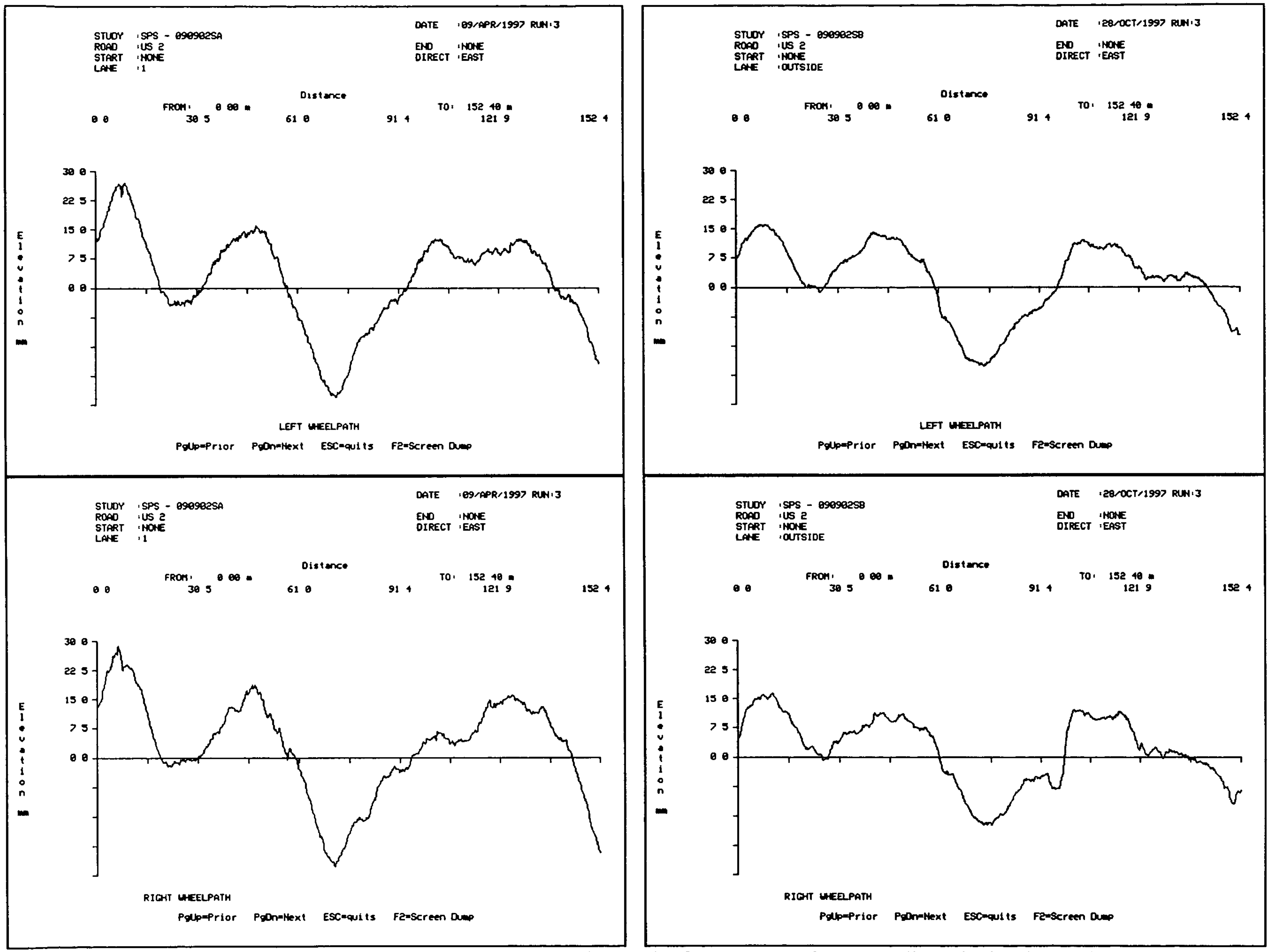


Figure 15 Profile Measurements, Section 090902, Before and After Construction, as Collected with the Profilometer™

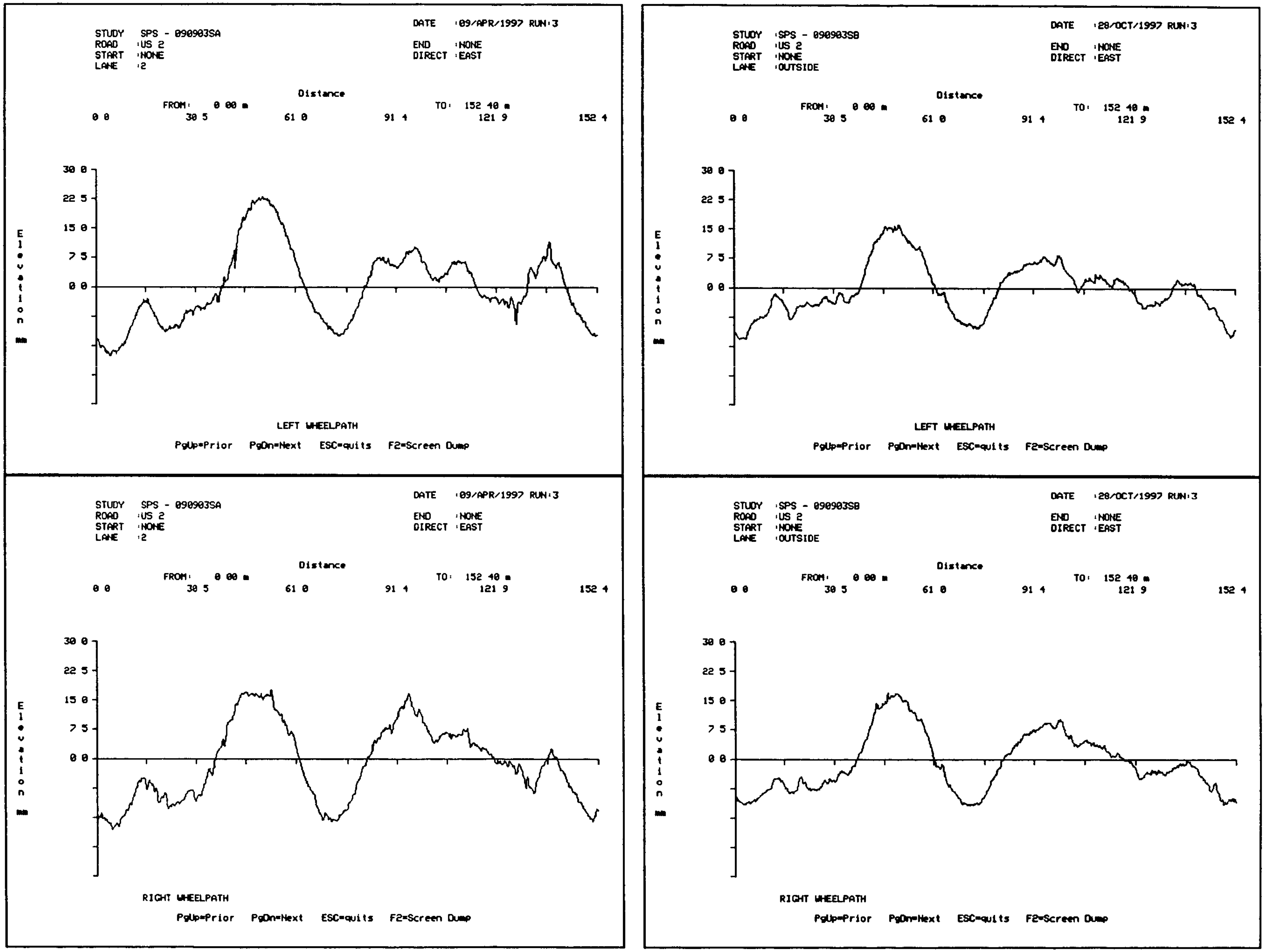


Figure 16 Profile Measurements, Section 090903, Before and After Construction, as Collected with the Profilometer™

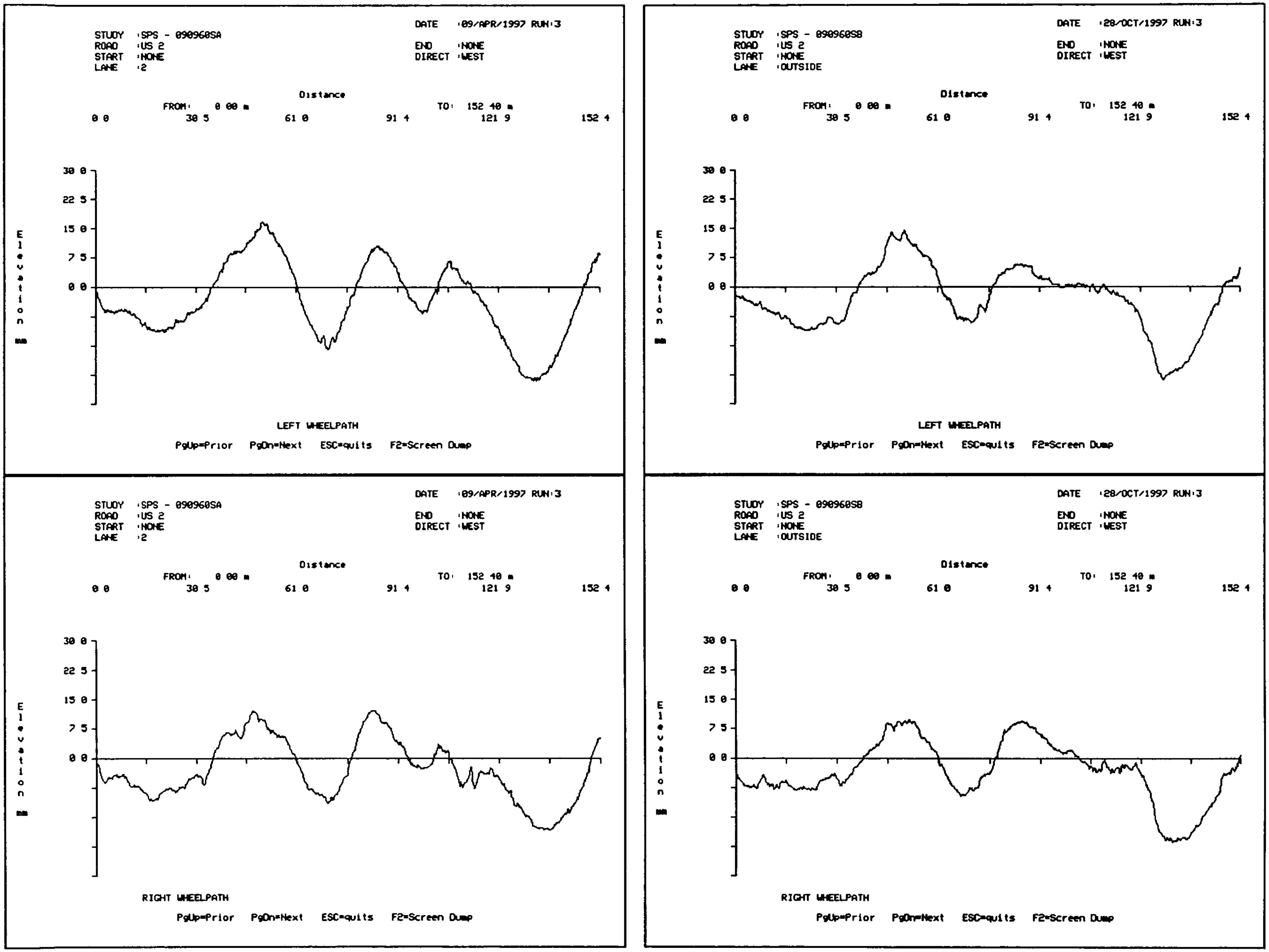


Figure 17 Profile Measurements, Section 090960, Before and After Construction, as Collected with the Profilometer™

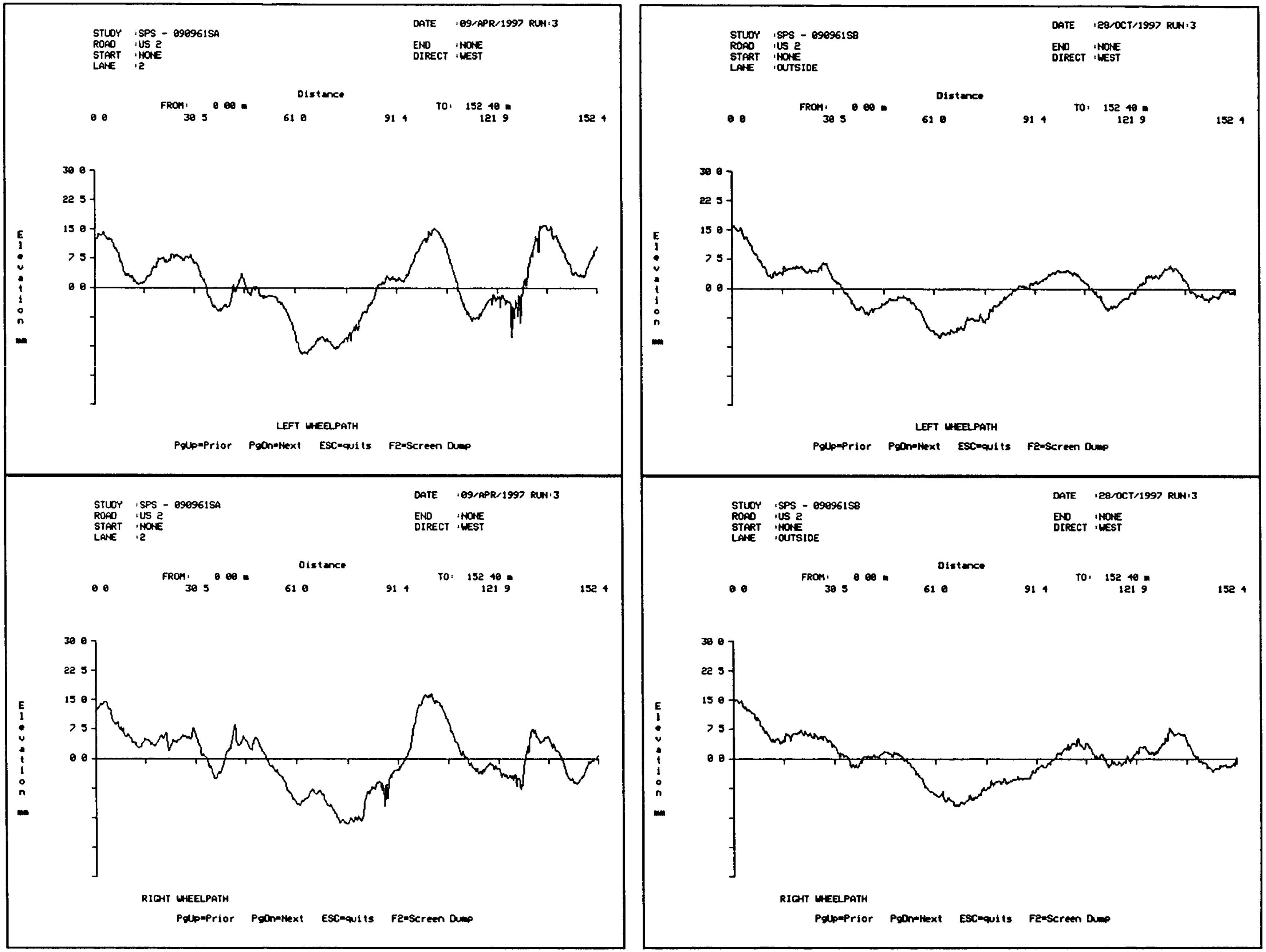


Figure 18 Profile Measurements, Section 090961, Before and After Construction, as Collected with the Profilometer™

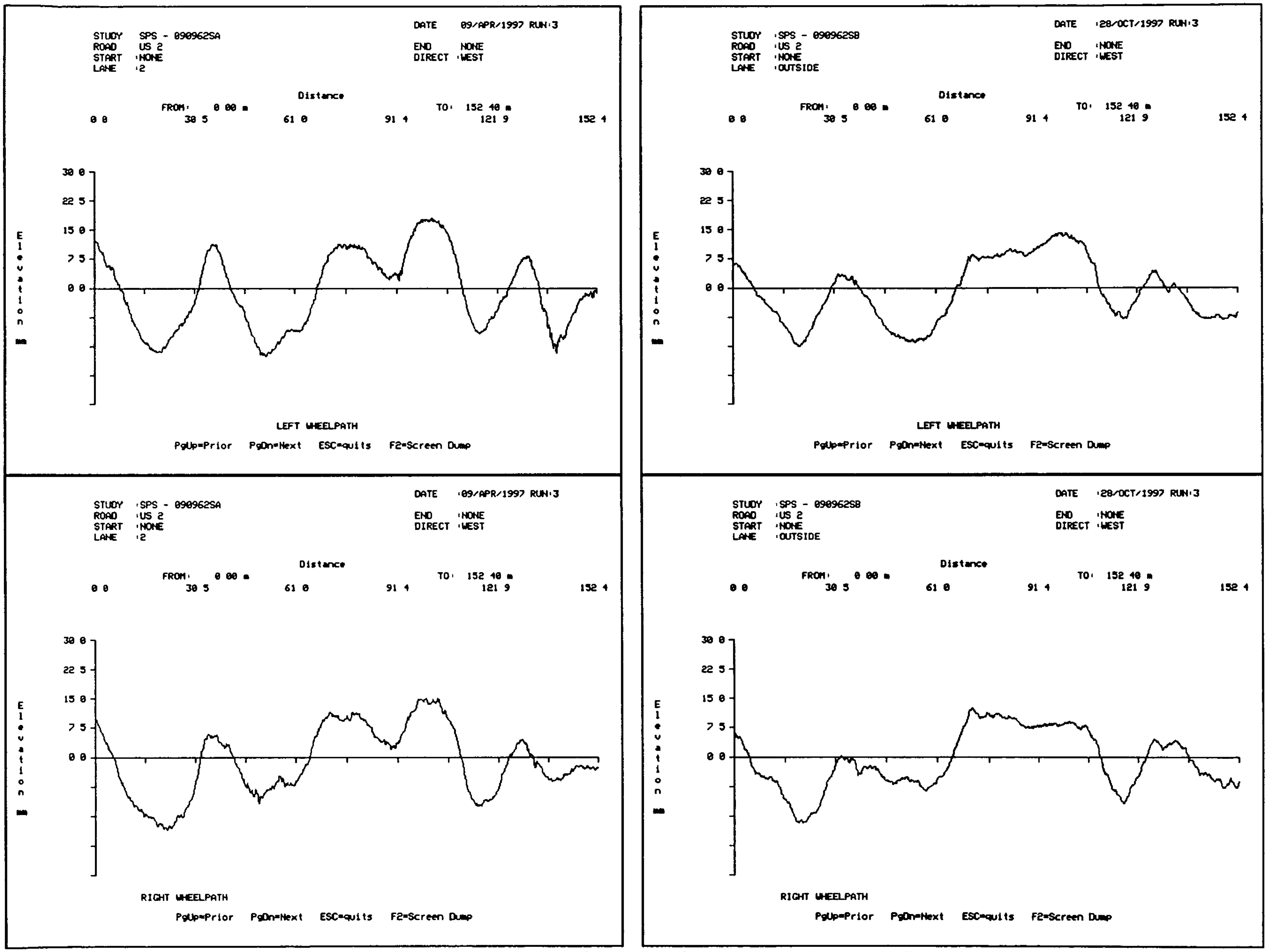


Figure 19 Profile Measurements, Section 090962, Before and After Construction, as Collected with the Profilometer™

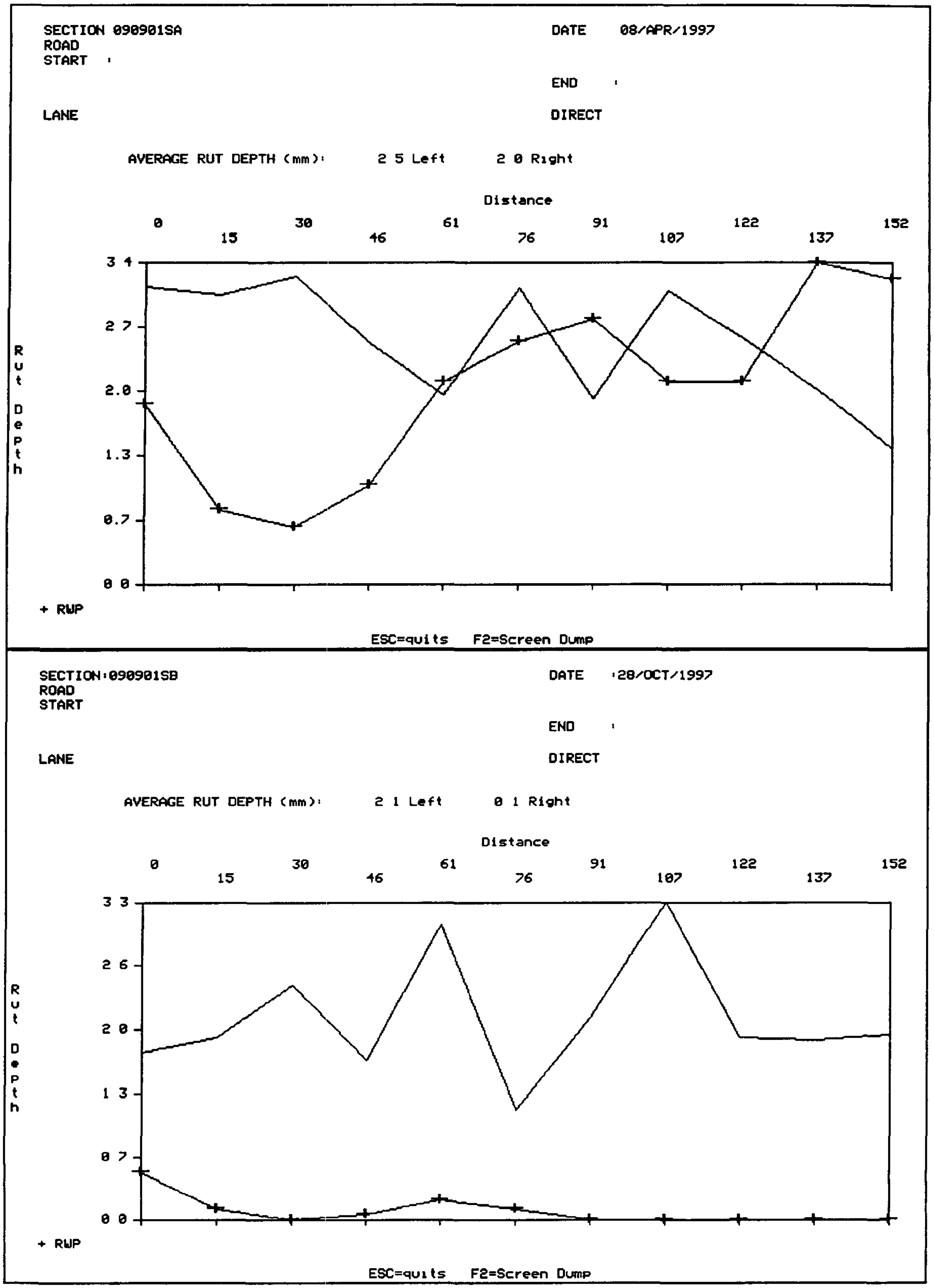


Figure 20 Rut Depth, Section 090901, Before and After Construction, as Measured by the Dipstick™

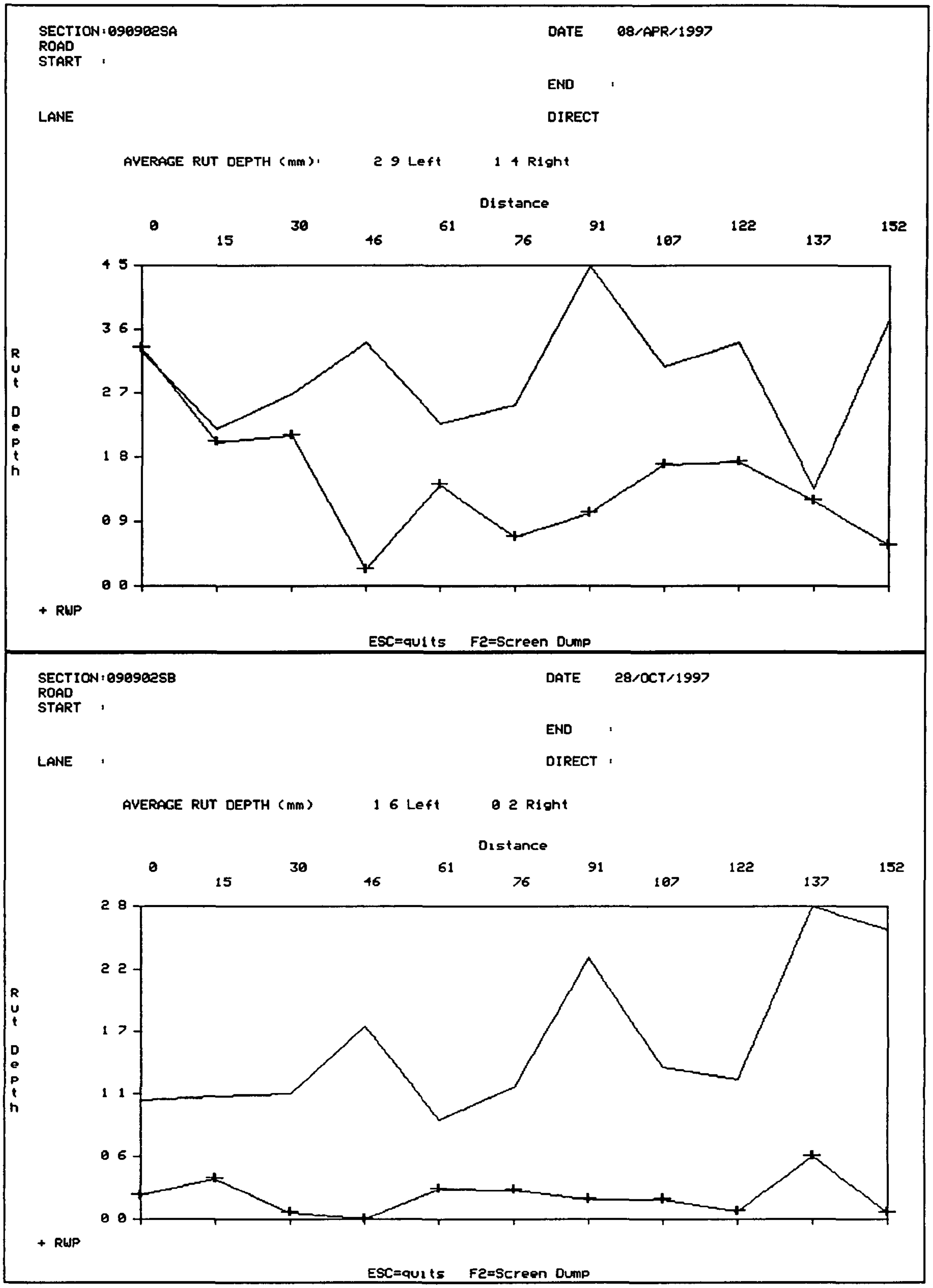


Figure 21 Rut Depth, Section 090902, Before and After Construction, as Measured by the Dipstick™

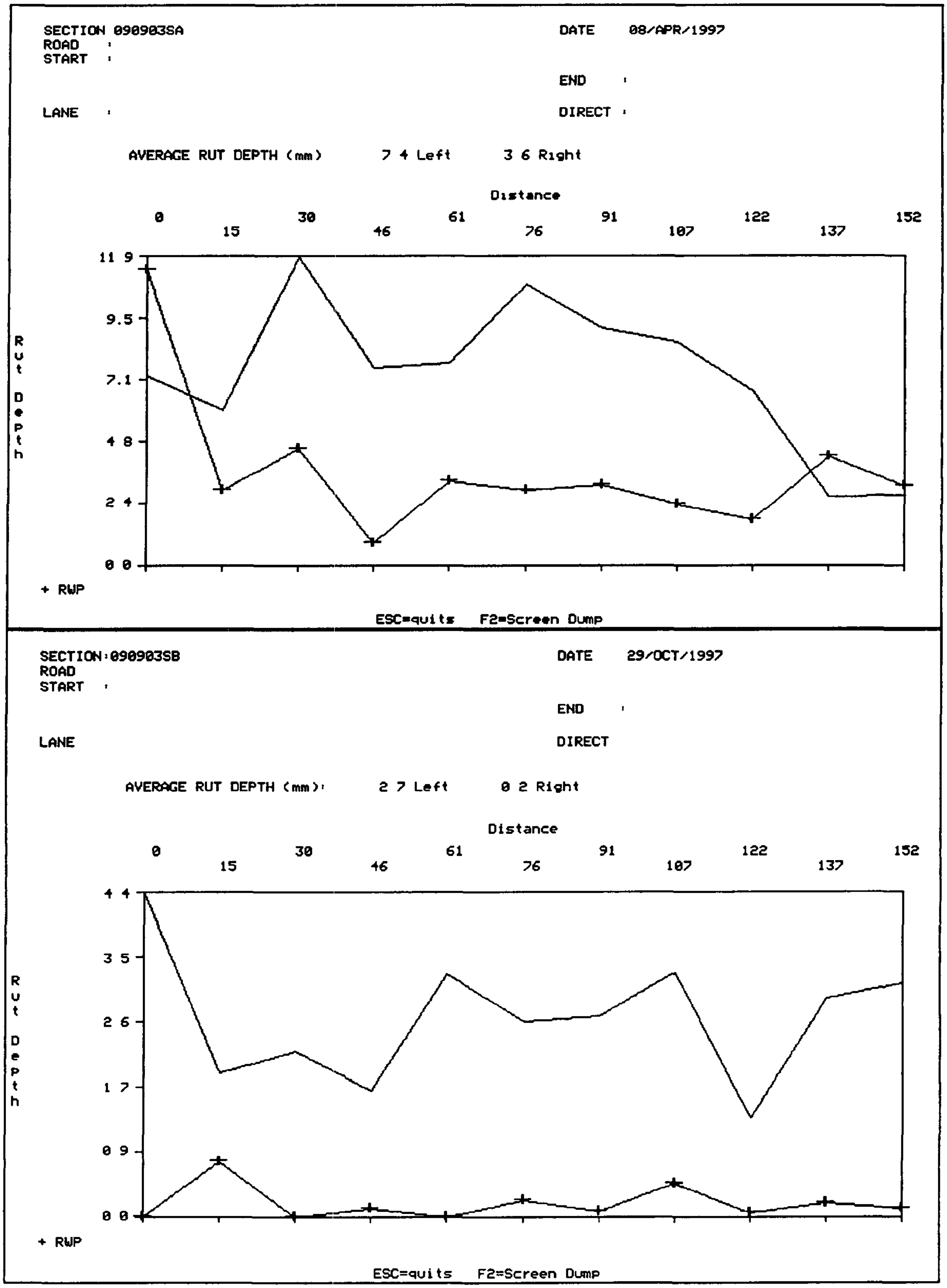


Figure 22. Rut Depth, Section 090903, Before and After Construction, as Measured by the Dipstick™

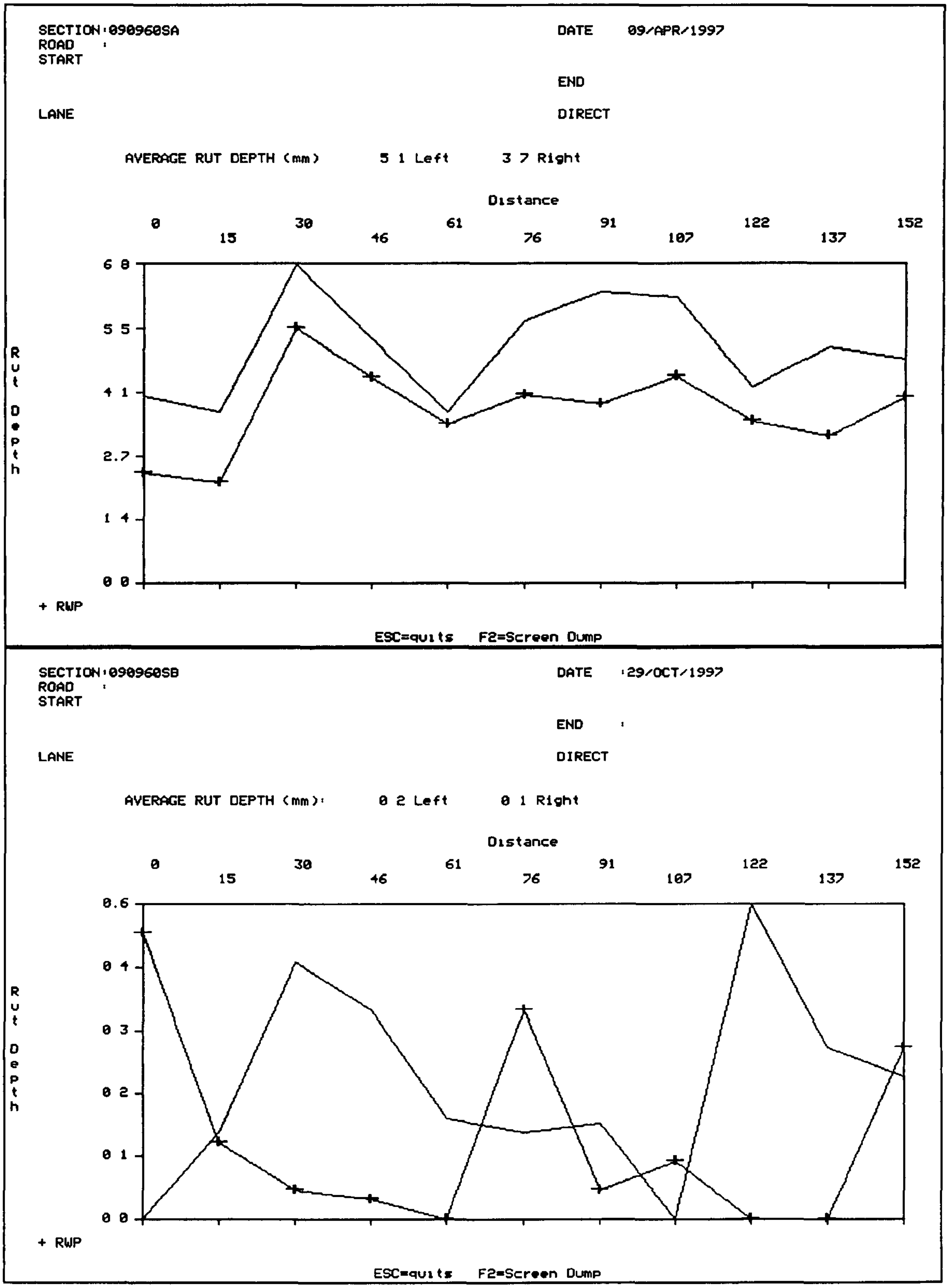
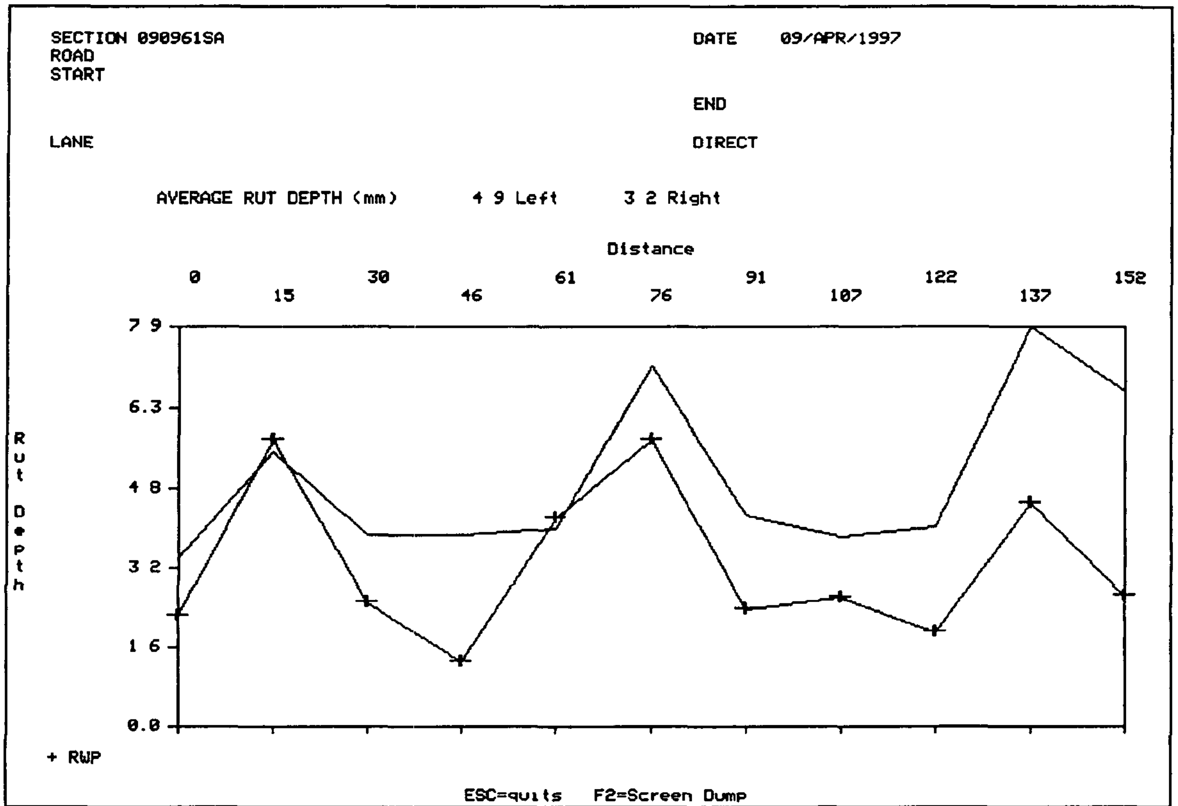


Figure 23. Rut Depth, Section 090960, Before and After Construction, as Measured by the Dipstick™



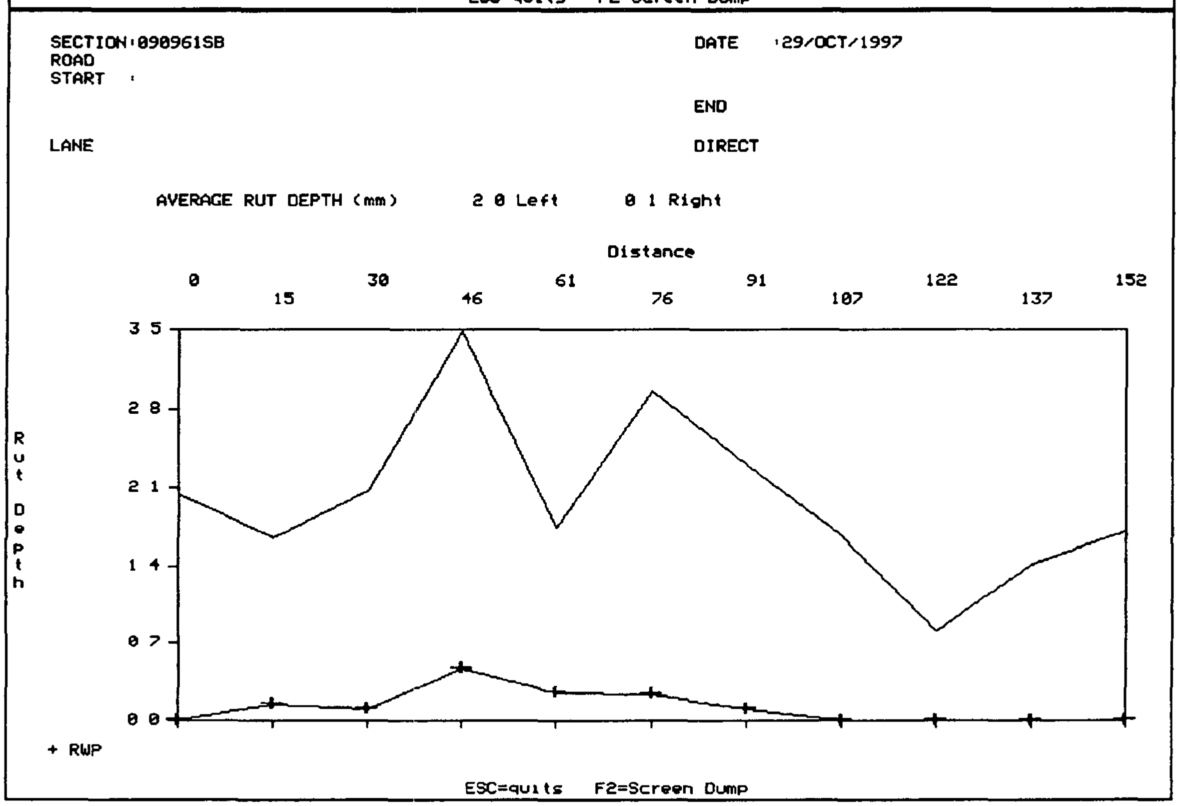


Figure 24 Rut Depth, Section 090961, Before and After Construction, as Measured by the Dipstick™

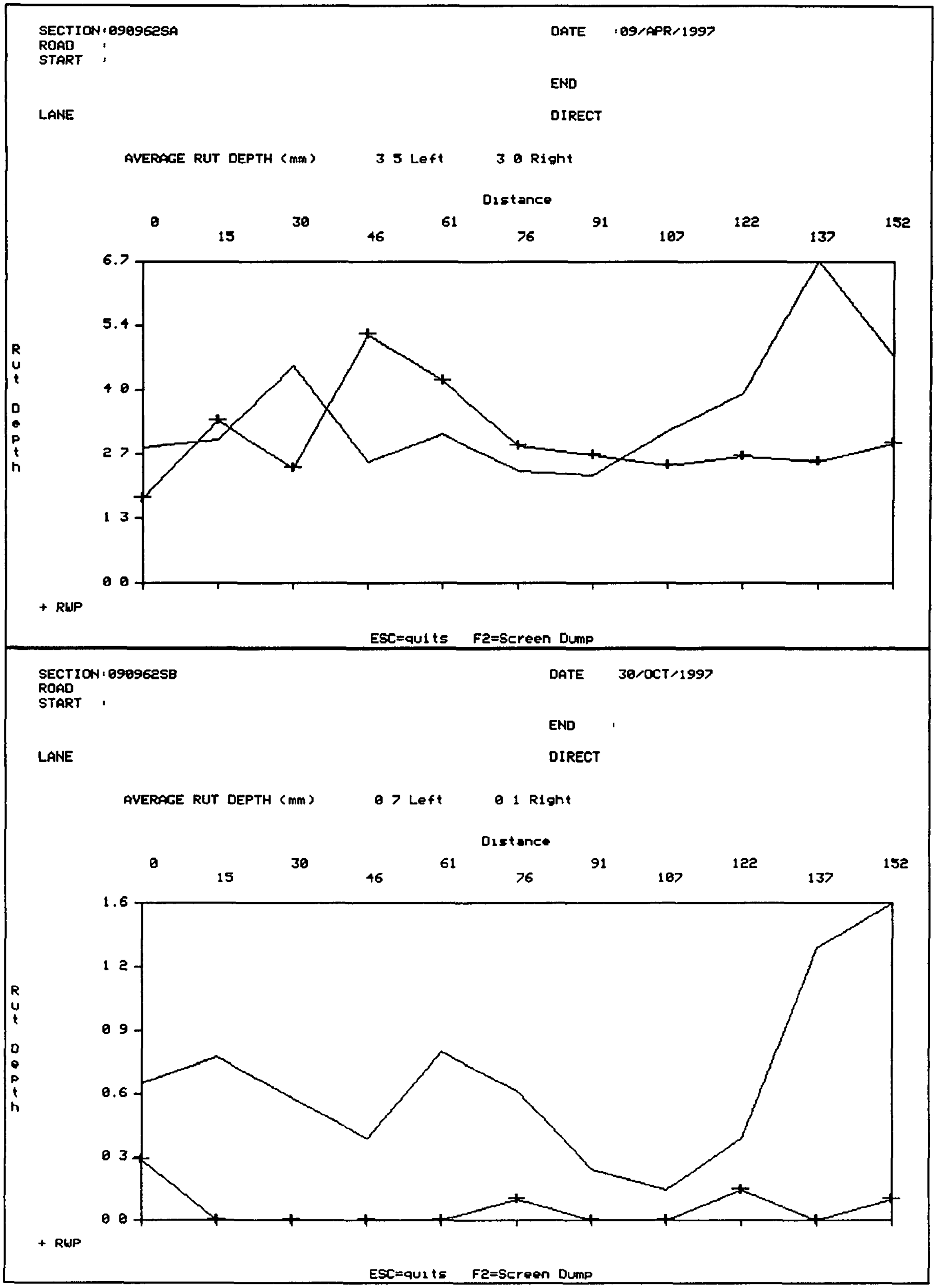


Figure 25 Rut Depth, Section 090962, Before and After Construction, as Measured by the Dipstick™

APPENDIX A

Correspondence, Contract Agreements, Job Mix Formulas, Mix Designs, Profilometer and FWD Surveys, and SPS Project Deviation Report

COPY

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

2800 BERLIN TURNPIKE, P.O. BOX 317546
NEWINGTON, CONNECTICUT 06131-7546
Phone: (203) 258-0372

AT & BP Has tape

JUL 10 1995
FILE #13.07.9

July 7, 1995

Dr. William Phang
Pavement Management Systems, Inc.
415 Lawrence Bell Drive
Unit #3
Amherst, NY 14221

Dear Dr. Phang:

Subject: CT SPS-9A Project, Route 2, Colchester/Lebanon

As discussed during your June 27, 1995 telephone conversation with Ms. Anne-Marie H. McDonnell of this office, a candidate SPS-9A site was selected for Connecticut. On June 27, 1995, Mr. Monte Symons reviewed the proposed location and indicated it would be approved at his level at the earliest possible date. As you are aware, it was necessary to have an accelerated approval procedure in order to meet the design and advertising deadlines for this location.

Enclosed for your information and use are the nomination forms, copies of the original construction plans, and supplemental boring logs. Also enclosed is a videotape to simulate a driver-view of the sections extracted from our photolog laser videodisc viewing system. If there are any questions involving this information, please feel free to call me or Ms. McDonnell.

You are invited to Connecticut to meet with us, view the section of roadway, and to lay out the test areas in the field, if necessary. However, we must have the test-section boundaries identified in the near future so that we can include this information in the project plans by July 24, 1995. We look forward to working with you and members of your staff in this endeavor.

Very truly yours,

Charles E. Dougan

Charles E. Dougan, Ph.D., P.E.
Manager, Research & Materials
Bureau of Engineering and
Highway Operations

Enclosures

cc: Ivan Pecnik

PAVEMENT
MANAGEMENT
SYSTEMS

MEMORANDUM

TO	Ivan J. Pecnik	**DATE**	July 18, 1995
FROM	Bill Phang	**PROJECT**	50451110
SUBJECT	SPS-9A Project 090900, SR 2 EB, Colchester, CT	**FILE**	13.07.9

The nomination of SPS-9A project 090900 on SR 2 EB, Colchester, CT has been reviewed.

The 3 sections proposed are on the two Eastbound lanes of SR 2, a 4-lane divided highway. The sections begin at the end of the acceleration taper from the ramp off Chestnut Hill Road, Colchester, at MP 26.49, and ends at MP 27.32, a distance of 0.83 miles (1.336km). The existing (1968) asphalt concrete pavement (6" AC on 6" ATB on 14" granular base and subbase on sand subgrade) appears to be in fair condition, and carries about 107k ESAL's per year.

The 98% reliability PG asphalt for this location is a PG 58-28, however local experience suggests that at this traffic level a PG 64-28 is more appropriate. This PG asphalt is acceptable in accordance with the guidelines, for the Superpave mix in Section 2.

The alternative Superpave mix in Section 3 is intended to test the low temperature cracking design problem, so a PG 64-22 asphalt is suggested by the DOT. The experiment guidelines requires a 2 grade increase in the low temperature component, i.e. a PG 64-16 binder. However, availability of this grade in the area is unlikely (NE User Producer Group Survey).

The asphalt binder for the normal CT mixes is an AC 20. The pavement overlay is to be a minimum of 65mm (2.5in.). There appears to be no reason to change the order of arrangement of the sections, i.e. the CT normal mix should be between Stations 118+00 and 128+00, the Superpave mix with PG 64-28 between 129+00 and 139+00, and the alternative Superpave mix with PG 64-22 between Stations 143+00 and 153+00.

415 Lawrence Bell Drive - Suite 3, Amherst, New York, 14221 [716] 632-0804 Fax [716] 632-4808

The project is scheduled for construction in April 1996. The nomination appears to meet all of the guideline requirements (except as noted because of unavailability of PG 64-16 binders that are non-modified), and it is recommended for acceptance.

CC: B. Abukhater
G. Cimini
B. Henderson
E. Lesswing

PMS PAVEMENT MANAGEMENT SYSTEMS

COPY

MEMORANDUM

bH
GC

TO	File	**DATE**	July 20, 1995
FROM	Bill Phang	**PROJECT**	50451110
SUBJECT	CT DOT SPS-9A Project, SR 2 EB, Colchester, CT - Meeting Notes, July 18, 1995	**FILE**	13.07.9

A meeting for this SPS-9A project was held in the DOT office, Rocky Hill, CT, July 18, 1995 at 8:30am. An attendance list is attached.

Charles Dougan reported that at a recent meeting with Monte Symons, he had received verbal approval to go ahead with the SPS-9A project on SR 2 EB at Colchester, which was to be overlaid in early 1996. The nomination forms were received by NARO.

The existing pavement is to be milled 2" and a 3" lift (2 1/2" compacted) is to be placed on both of the Eastbound lanes. The project is 5+ miles, and for purposes of control of production of a uniform mix for each of the mix formulations, would utilize a day's production as the change point for each mix. The first mix to be laid is the agency mix (Marshall design with AC20). The second mix is Superpave with PG 64-28. The third mix is Superpave gradation with PG 64-22 (no modifier to be used). The possibility of adding 30% reclaimed asphalt pavement in a supplemental test section was discussed, as this is a common practice in CT. The method for Superpave design with recycled material has not yet been addressed by LTPP.

The project is a maintenance project and has not been put together in metric (SI units). The monitoring length, 500 ft., will be established within the day's production (approximately 1 mile) by Anne-Marie McDonnell.

The mix design and QC procedures will be Contractor responsibilities. CT DOT will approve the mix designs and do QA testing. A draft QC plan (Version 1.0, April 27, 1995, NCHRP 9-7) was circulated, copy attached.

The contract will be advertised and let later this year, or early next year, and construction is planned for April or early May 1996. A pre-construction meeting will be scheduled.

Temperature monitoring and WIM instrumentation were discussed. Research accepted responsibility for installation after construction. Because of simplicity of installation of the pavement temperature probe, only one set of temperature monitoring equipment is needed.

A typical test section existing pavement sampling plan is to be developed by NARO and sent to CT DOT by August 01, 1995. The complete materials sampling and testing plans for the project should be with CT DOT by September 01, 1995.

CC: I.J. Pecnik
E. Lesswing

COPY

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

2800 BERLIN TURNPIKE, P.O. BOX 317546
NEWINGTON, CONNECTICUT 06131-7546
Phone: (203) 258-0372

AUG 03 1995
JOB #
FILE # 13-07.9

to B.A. for file.

July 26, 1995

Dr. William Phang
Pavement Management Systems, Inc.
415 Lawrence Bell Drive, Unit #3
Amherst, NY 14221

Dear Dr. Phang:

Subject: FHWA-SPS-9A Meeting, July 18, 1995

Enclosed for your records is the subject meeting Summary. I was pleased that you were able to attend the meeting and look forward to continue working with you on this experiment.

Very truly yours,

Charles E. Dougan

Charles E. Dougan, Ph.D., P.E.
Manager, Research and Materials
Bureau of Engineering and
Highway Operations

Enclosure

Meeting Summary

Topic: FHWA SHRP SPS-9A
Meeting Date: July 18,1995
Location: Rocky Hill Lab

IN ATTENDANCE:

LTPP REGIONAL OFFICE: Ivan Pecnik, Bill Phang
ConnDOT MAINTENANCE: Joseph Misbach, Jeff Hagen, Anthony Siragusa
ConnDOT RESEARCH AND MATL: Charles Dougan, Keith Lane, Jim Sime
Anne-Marie McDonnell, Nick Corona

PURPOSE: To discuss and plan the installation of a LTPP-SPS-9A experiment in Connecticut. Of particular focus: site layout, binder selection and specification, testing and sampling plans, sites instrumentation and materials specifications.

TRANSACTIONS:

1. C. Dougan described CT Project 28-185 on Route 2 in Colchester/ Lebanon CT that had been selected for SPS-9A. Monte Symons in the Washington SHRP Office has reviewed the site and indicated approval can be obtained quickly.

2. Potential test-section layouts were discussed. B. Phang stated that the three test sections required by LTPP should be in the same directional roadway, so that traffic will be identical. It was agreed that the Eastbound roadway will be divided into three sections, and 1000ft will be designated in each paved section within which 500ft will be monitored. C. Dougan requires at least one mile of paving for each pavement type.

3. The binders proposed, a 64-28 for the superpave section and a 64-22 for the alternative superpave section were accepted by B.Phang. They will be approved based on the climate and traffic volumes in Connecticut. C. Dougan expressed opposition to the use of modifiers, noting cost as the main reason. ConnDOT Class 1 will be the control mix.

4. It was agreed that the following sections will be placed:

#1 State Design CT Class I
#2 Superpave (64-28 Binder)
#3 Superpave Alternative(64-22 Binder)

The Mix design will be the same for #2 and #3. The only difference will be the binder. A PG 64-22 will be substituted in #3. Test section #1 will be placed first.

5. The location of each test section will be identified prior to the pre-paving monitoring. There will be a numbering system for the test sections provided by B.Phang.

6. The use of recycled materials was discussed. The LTPP Reps stated that <u>no recycling materials should be used in the test sections</u>. C. Dougan and K. Lane expressed strong opinions about the message that Superpave is projecting by not providing for recycling in the mixes. It was decided that recycling may be included by the use of additional test

sections. CT personnel will review this subject and submit their proposal to test Superpave with recycled materials in the mix.

7. It was decided that the contractor will be responsible for the mix design. A separate bid item will be set-up to address mix design. A list of qualified vendors will be provided to the contractor. The quality control will be conducted by the contractor. The quality assurance will be conducted by ConnDOT Material Testing personnel.

8. It is anticipated that the project will be awarded in Jan/Feb 1996; for action in the Spring (potentially May). The Regional contractor will be notified of pertinent construction/award meetings so that their personnel can be present. Washington FHWA personnel responsible for the SHRP trailer will be notified of the project, its general time frame and requested to schedule the SHRP trailer for use in Connecticut.

9. B. Phang explained that the pavement needed to be placed to achieve a finished 2 1/2" lift. This is only for the purpose of the testing, and not a requirement of the Superpave program.

10. Monitoring and testing will be required prior to, during, and after paving. Prior to paving, the state must: obtain cores, gather samples, and provide traffic protection for FWD testing. B. Phang will submit sampling and monitoring requirements to the state.

11. It will be stated that all paving is to take place during the same construction season. This will be addressed in the contract governing this work.

12. The test sites will be instrumented with weigh-in-motion and a temperature probe. Installation will take place after the paving has been done and by a separate contract.

13. I. Pecnik explained that because this SPS-9A is a new activity, incentive money is available ($30,000. He will write a letter to C. Dougan approving the project and noting the $30,000 incentive. The money can be used for any of the following purposes: material testing, traffic control, or traffic data collection equipment.

WORK TO BE CONDUCTED:

1. K. Lane will organize a QA/QC plan. He will develop the binder specification by August 1st.

2. A. McDonnell will define the test sections by August 1st. She will prepare the wording for the 2 1/2" finished lift; control section to be paved first; and one season paving only.

3. A.McDonnell will also coordinate the maintenance and protection of traffic for the "Pre-Paving" testing.

4. B.Phang will have the "Pre-Paving" test plan to the state by August 1st. He will have the numbering scheme;"during-paving" testing; and the "After-Paving" plans to the state by September 1st. B. Phang will be forwarding the Maryland Superpave special provisions to Connecticut personnel.

5. C.Dougan will be calling FHWA regarding the scheduling of the Federal Trailer.

POST MEETING:
LTPP Representatives B. Phang and I. Pecnik conducted a drive-over over the test areas with A. McDonnell. The site selected was deemed favorable by B. Phang and I. Pecnick.

cc:FHWA-CT Amy Jackson-Grove

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

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Phone: (203) 258-0372

AUG 30 1995
FILE # 13.07.9

August 24, 1995

Mr. William Phang
Pavement Management Systems, Inc.
415 Lawrence Bell Drive
Unit #3
Amherst, NY 14221

Dear Mr. Phang:

Subject: CT SPS-9A Monitoring Section Locations

Following our July 18, 1995 meeting on SPS-9A, a revised layout of test sections was developed. Enclosed for your information and use are tables and plans detailing the subject. This information is in addition to that supplied with the July 7, 1995 correspondence. Supplemental areas, as discussed, are included in the project in order to examine Superpave™ mixes containing recycled materials (RAP). In total, six different pavement-surface mixes will be placed. I look forward to finalizing our follow-up actions on this activity on all test and control sections.

Please call Ms. Anne-Marie H. McDonnell at (203) 258-0308 if there are any questions.

Very truly yours,

Charles E. Dougan

Charles E. Dougan, Ph.D., P.E.
Manager, Research & Materials
Bureau of Engineering and
Highway Operations

Enclosures

ENCLOSURE; TABLE A
STATE PROJECT NO. 28-185
CONNECTICUT SPS-9A PAVING LOCATIONS
ROUTE 2

EASTBOUND ROADWAY

SECTION DESIGNATION	TYPE OF SURFACE PAVEMENT	EASTBOUND MILEAGE ROUTE 2	LENGTH OF PAVING (MILES)	MILEAGE OF SPS AREA	CONSTRUCTION STATIONS (1968) PLANS	500'LOCATION
I	CT CLASS 1	25.48-27.48	2.00	26.70-26.90	129+00-139+00	132+00-137+00
II	SUPERPAVE (64-28 BINDER)	27.48-29.70	2.22	28.77-28.96	238+00-248+00	241+00-246+00
III	SUPERPAVE ALTERNATIVE (64-22 BINDER)	29.70-31.72	2.02	29.83-30.02	294+00-304+00	296+00-301+00

WESTBOUND ROADWAY

SECTION DESIGNATION	TYPE OF SURFACE PAVEMENT	WESTBOUND MILEAGE ROUTE 2	LENGTH OF PAVING (MILES)	MILEAGE OF SPS AREA	CONSTRUCTION STATIONS (1968) PLANS	500'LOCATION
IV	CT CLASS 1 RAP 25% +/-5%	31.72-29.64	2.08	30.08-29.89	302+00-292+00	301+00-296+00
V	SUPERPAVE RAP 25% +/- 5%	29.64-27.56	2.08	28.53-28.34	220+00-210+00	218+00-213+00
VI	SUPERPAVE ALTERNATIVE RAP 25% +/- 5%	27.56-25.48	2.08	27.45-27.26	163+00-153+00	162+00-157+00

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ENCLOSURE: TABLE B:
STATE PROJECT NO. 28-185
PAVING LOCATIONS CT ROUTE 2

EASTBOUND ROADWAY

SECTION DESIGNATION	TYPE OF SURFACE PAVEMENT	EASTBOUND MILEAGE ROUTE 2 (Based on PID mileage)	LENGTH OF PAVING (MILES)	LOCATION REFERENCE (Based on 1994 Photolog Images)
I	CT CLASS 1	25.48-27.48	2.00	BEGINS: 0.49 MILE WEST OF CHESTNUT HILL ROAD UP, TOWN OF COLCHESTER.
II	SUPERPAVE (64-28 BINDER)	27.48-29.70	2.22	BEGINS: 1.51 MILE EAST OF CHESTNUT HILL ROAD UP, TOWN OF COLCHESTER.
III	SUPERPAVE ALTERNATE (64-22 BINDER)	29.70-31.72	2.02	BEGINS: 0.03 MILE EAST OF CAMP MOWEEN ROAD, TOWN OF LEBANON. ENDS: 0.81 MILE EAST OF SCOTT HILL ROAD #1 UP, TOWN OF LEBANON.

WESTBOUND ROADWAY

SECTION DESIGNATION	TYPE OF SURFACE PAVEMENT	WESTBOUND MILEAGE ROUTE 2 (Based on PID mileage)	LENGTH OF PAVING (MILES)	LOCATION REFERENCE (Based on 1994 Photolog Images)
IV	CT CLASS 1 RAP 25%	31.72-29.64	2.08	BEGINS: 0.70 MILE EAST OF SCOTT HILL ROAD UP, TOWN OF LEBANON.
V	SUPERPAVE RAP 25% (64-28 BINDER)	29.64-27.56	2.08	BEGINS: 0.13 MILE WEST OF CAMP MOWEEN ROAD, TOWN OF LEBANON.
VI	SUPERPAVE ALTERNATE RAP 25% (64-22 BINDER)	27.56-25.48	2.08	BEGINS: 1.49 MILE EAST OF CHESTNUT HILL ROAD, TOWN OF COLCHESTER. ENDS: 0.59 MILE WEST OF CHESTNUT HILL ROAD UP, COLCHESTER.

From: Monte Symons (MSYMONS)
To: IPECNIK
Date: Monday, September 11, 1995 2:29 pm
Subject: SPS-9A Ontario and Connecticut

The nominations of SPS-9A projects for Ontario and Connecticut have been received and reviewed. The following is the results of that review:

1. SPS-9A Ontario - Highway 17 near Buchanan Twp. Line. The project is approved for inclusion in the LTPP SPS-9A experiment. Construction is expected in fall 1996. Incentive funds are expected to be available in FY-96 and will be transferred to C-SHRP.

2. SPS-9A CT - Route 2 east of Chestnut Hill Underpass in Colchester. This project is approved for inclusion into the SPS-9A experiment. Incentive funds are expected to be available in FY-96 and will be transferred through FHWA federal procedures.

CC: grada

ITX
Stanley

TECHNICAL MEMORANDUM

TO: LTPP Contacts - CT, NJ, QE, NC

FROM: Bill Phang

DATE: 19 September 1996

REFERENCE: **SPS-9A MATERIALS TESTING AT LCL AND SRTC**
FILE: 50451231-13.9

Please be advised that the costs of sampling, packaging, shipping and testing of materials for the SPS-9A project are the responsibility of the agency, except as noted below:-

The Materials Research Library (MRL) in Reno, NV will supply special containers for asphalt samples and will pay the shipping charges both ways.

The LTPP Contractor Laboratory (LCL), Law Engineering, Atlanta, GA will carry out the laboratory testing and the FHWA-LTPP Division will pay the testing costs. The state agency will pay for shipping the materials and samples to Law Engineering, Inc. attn.: Mr. Richard Boudreau, 396 Plasters Ave., NE, Atlanta, GA 30324, telephone (404)817-0242, fax (404) 872-5927.

The Superpave Regional Test Center (SRTC) for the LTPP North Atlantic Region is at Penn State University. Please contact Dr. David Anderson, Penn State University, Research Office Building, University Park, PA 16802, telephone (814)863-1912, fax (814)865-3039 to arrange for Superpave testing. Agencies also pay for shipping costs.

North Carolina DOT has arranged for Superpave testing with the SRTC operated by NCAT at Auburn.

Should you have any questions, please all me at (716)632-0804 or speak to Mr. Ivan Pecnik at (716)631-5205.

Sincerely,
ITX Stanley Ltd.
Pavement Management Systems Division

William A. Phang

William A. Phang
LTPP Principal Investigator

cc: I.J. Pecnik, P.E., RE-NARO
E. Lesswing, NARO
B. Abukhater, NARO

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STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

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NEWINGTON, CONNECTICUT 06131-7546
Phone: (860) 258-0372

L [illegible] OCT 10 1996
JOB #
FILE # 13.07.9

October 3, 1996

Dr. William A. Phang
LTPP North Atlantic Principal Investigator
ITX Stanley Ltd.
415 Lawrence Bell Drive
Suite 3
Amherst, New York 14221-7805

Dear Mr. Phang:

Subject: Pre-Construction Planning Meeting for SPS 9A

This letter follows a telephone conversation between you and Mr. Donald Larsen of this Office on October 2, 1996 regarding the subject meeting. The meeting is scheduled to be held at the ConnDOT Materials Laboratory Conference Room in Rocky Hill, CT on Thursday, November 4, 1996. I am pleased that you and your designated field representative(s) will meet with our staff, who are/will be involved with planning, sampling, testing and monitoring of the SUPERPAVE Project for Route 2. Prior to the meeting my staff will assemble a list of questions and discussion topics. I will get a copy of these issues to you prior to the meeting.

In general, the purpose of the meeting is to address the questions that have arisen at this end while reviewing the various LTPP documents; to determine who is responsible for various field tasks during the construction activities; and, discussion of issues such as Qc/Qa.

Upon receipt of this letter, please call Mr. Donald Larsen of this Office to confirm that you will attend. His telephone number is (860) 258-0301.

Thank you in advance.

Very truly yours,

Charles E. Dougan

Charles E. Dougan, Ph.D., P.E.
Manager of Research and Materials
Bureau of Engineering and Highway Operations

cc: Ivan J. Pecnik - LTPP North Atlantic Regional Engineer

SPS-9A Project 090900 Meeting Notes
CONNDOT Laboratory, Rocky Hill, CT
9:00am - November 4, 1996

File: 13.07.9

Attendees (Attachment A)

W.A. Phang - ITX Stanley-NARO
E. Lesswing - ITX Stanley-NARO
[redacted]TX Stanley-NARO
E. Betancourt - FHWA Division
J. E. Stephens - U of CONN.

C. Dougan - CONNDOT
D. Larsen - LTPP Contact
N. Rodrigues - CONNDOT Asphalt Lab
K. Lane - CONNDOT Coring
N. Corona - CONNDOT
J. Henault - CONNDOT

Agenda (Attachment B)

1) The CONNDOT questions & NARO responses were reviewed and discussed.
2) NARO general notes (Attachment C) were discussed.
3) Don Larsen is the assigned on-site CONNDOT representative w.r.t. the SPS-9A project.

   Nelio Rodrigues and 4 or 5 laboratory staff will participate. A 2-man field sampling crew, a 2-man laboratory crew, and an observer at the paver in 2-way radio communication with the 2-man crew at the plant.
4) Basel Abukhater will prepare the field operations data sheets as much as practical.
5) The contract is to be awarded 11/5/96. NARO will be invited to attend a pre-construction meeting with the contractor.
6) Jack Stevens could be either doing the mix design work for the contractor or be overseeing the Superpave design QA for CONNDOT.
7) Mix design work should be initiated in January 1997.
8) A planning schedule for CONNDOT for laboratory testing of materials and mixes from February 1997 through June 1997 was presented by Nelio Rodrigues together with a draft of proposed testing requirements for QC and LTPP (Attachment D).
9) Copies of the Special Provisions (Attachment E) and other contract specifications for Project 28-185 were given to NARO.
10) Basel Abukhater continued to meet with Don Larsen and Nelio Rodrigues on November 5, 1997, to examine in detail the SPS-9A Materials Sampling and Testing Plan. Many needed revisions were identified, and were expected to be completed in the next two weeks.

U N I V E R S I T Y O F

CONNECTICUT

CONNECTICUT ADVANCED PAVEMENT LABORATORY

November 6, 1996

Mr Joseph St. Germain
Soneco/Northeastern Inc.
Box S
Groton, CT 06340

PROJ 28-185

Dear Mr. St.Germain:

At the Technical Pre-Construction Planning Meeting for CT SPS-9A held at Rocky Hill Monday, concern was expressed as to the effect of mix design timing on the construction schedule. The aging of the mix and molding the large number of gyro compacted specimen needed can take 10 days to two weeks. This should not be a problem for the mixes using 100 percent virgin material if material can be available soon.

Timing for the mixes utilizing RAP may become a problem. There is little information as to the exact procedures needed. The time period for design will be longer. All the steps for a normal design must be carried out. In addition, there may be numerous extractions, recoveries and gradings that will extend the required design time. If mix designs are to be submitted to ConnDOT 60 days ahead of laydown, it is imperative to get samples of the RAP as soon as possible so that the background work can be started

I have not seen the site but surely some place can be found where milling can be done now Care must be taken in site selection to insure that the millings so obtain are representative of the material that will be obtained from milling next spring.

Please keep me advised as to the availability of RAP so that a work schedule can be developed.

Very truly yours,

Jack E Stephens

Jack E Stephens
Director, CAP Lab

An Equal Opportunity Employer

179 Middle Turnpike U-202, Storrs, Connecticut 06269-5202 (860) 486-5956 Fax (860) 486-2399

CC [redacted]

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DEPARTMENT OF TRANSPORTATION

2800 BERLIN TURNPIKE, P.O. BOX 317546
NEWINGTON, CONNECTICUT 06131-7546
Phone: (860) 258-0372

November 12, 1996

Dr. William A. Phang
LTPP North Atlantic Principal Investigator
ITX Stanley Ltd.
415 Lawrence Bell Drive
Suite 3
Amherst, New York 14221-7805

Dear Dr. ~~Phang:~~ Bill

Subject: Summary of Meeting: November 4 & 5, 1996

Enclosed for your information is a summary of the subject meeting prepared by Mr. Donald Larsen. If there are any comments or questions on the summary, please contact Mr. Larsen at (860) 258-0301.

Very truly yours,

Charlie

Charles E. Dougan, Ph.D., P.E.
Manager of Research and Materials
Bureau of Engineering and Highway Operations

Enclosure

cc: Ivan J. Pecnik - LTPP North Atlantic Regional Engineer

Meeting Summary
Topic: FHWA LTPP CT SPS 9A - Route 2 Colchester - Technical Pre-Construction Planning Meeting
Date: November 4 1996
Location: ConnDOT Materials Testing Laboratory - Rocky Hill, CT

In Attendance:
LTPP Regional Office:
William Phang
Edward Lesswing
Basel Abukhater
FHWA CT Division:
Ed Betancourt
Univ. of Connecticut:
Jack Stephens
ConnDOT:
Raffaele Donato
Nelio Rodrigues
Nick Corona
Keith Lane
Charles Dougan
John Henault
Donald Larsen

Purpose: To discuss issues relevant to the installation of the LTPP-SPS-9A experiment (090900) in Connecticut.

Transactions: The meeting was started by Dr. Dougan and Mr. Larsen at 9:00 a.m.

1. A series of 37 questions that were sent to Mr. Phang of the LTPP Regional Office on October 21, 1996, and the responses to the questions, which were received from the LTPP Regional Office (ITX) on October 30, 1996, were discussed in detail. In summary:

a) The PG grades of 64-28 and 64-22 remain as approved for project 28-185 without revision;

b) ConnDOT will collect ARAN IRI roughness data. ITX will collect K.J. Law Profilograph data (IRI). Roughness data that ConnDOT collects will be compared by ITX to the K. J. Law Profilagraph.

c) Thickness data for the overlay obtained from cores should be reported as mean and standard deviation.

d) Ontario has not allowed automatic controls to be utilized on the paver in the Superpave test sections. However, ITX stated that usage of such controls in Connecticut is up to us. Dr. Dougan indicated that a determination of their usage will be based upon what is found during paving of the portions prior to the 1000-ft SPS test monitoring section.

e) Nuclear density tests during construction should be performed on the binder course (class 2).

f) The Qc/Qa process used in Ontario was one submitted by the successful bidder for the project.

g) Sampling from haul vehicles with shovels is acceptable as long as the vehicles are properly tagged and tracked. Radio contact between plant and field personnel would be helpful. Reheating the material after it has cooled to ambient temperature is acceptable. The use of multiple gyratory compactors for the testing is acceptable. ConnDOT will not be using dry ice during coring.

h) If lanes are ultimately shifted from where they were originally constructed, the material under the shoulder must be checked to ensure there is no structural difference from the travel lane.

i) Since cores are sawed on both ends, the minimum thickness required to end up with a core at least 52 mm in thickness is 65 mm.

j) After cores are removed, refilling of the core holes with proper compaction is required. An electric drill with a 6-in vibrating plate attached was a device used by the Quebec Ministry of Transport to compact core holes.

2. A paper entitled "General Notes for SPS-9A Project - 090900 Rt 2, Colchester, CT" was handed out by Mr. Phang for information and discussion. The handout is attached.

3. Dr. Dougan mentioned that Mr. John D'Angelo and Mr. Byron Lord have been contacted, and the FHWA trailer will be in Connecticut during Superpave™ paving in 1997. Invitations will be sent to New England states and New York to attend an open house during the project.

4. Mr. Phang noted that Michigan DOT is interested in the recycling (RAP) with Superpave portion of the project. They will probably contact us regarding obtaining samples from CT.

5. Mr. Phang suggested that when cores are shipped to Atlanta and elsewhere that they not only be wrapped in bubble wrap, but also that PVC pipe of approximately 8 in diameter be used to surround and protect the cores.

6. Mr. Rodrigues discussed the Proposed Testing Plan for the construction project, which was passed out by Mr. Larsen along with the Special Provisions for the project. (Mr. Larsen also supplied one copy of ConnDOT Form 814A and Supplemental Specifications to Mr. Phang.) A barchart of proposed activities was also passed out and discussed. Prof. Stephens noted the schedule for mix design requires designs to be completed by the end of February. He questioned how that could be accomplished for the recycled sections if the RAP to be used was not available. **It was recommended that some milling of route 2 be performed in the near future to obtain material that can be used in the design.** The milled section can be overlaid with class 2.

7. Dr. Dougan noted that the contract was to be signed with SONECO on November 5 at 1:30 p.m. (ED. Note: the contract was signed on that date) The ConnDOT District 2 Engineer has been instructed to contact Mr. Larsen for any questions on the project. The pre-construction meeting has not been scheduled yet.

8. Mr. Phang noted that New York State DOT was very pleased with their superpave projects to date and as a result saw no need to participate in the SPS 9A esperiment.

9. Some discussion ensued on Qc/Qa. Mr. Larsen asked, What is supposed to be included in the Qc/Qa plan? Mr. Abukhater provided the quality control plan submitted by Smiths Construction Company Arnprior Limited for the Ontario SPS 9A project. Mr. Phang suggested that whatever ConnDOT submitted would be used, and that there was no guideline in existence for the plan. Dr. Dougan spoke with John D'Angelo of FHWA, who told him that what we were doing sounded fine. Dr. Dougan felt that the proposed testing plan discussed earlier in the meeting would be used as the Qc/Qa plan. Mr. Phang agreed that this would qualify as the plan.

The formal portion of the meeting ended at 1:45 p.m.

The following individuals remained to begin discussion of the first item of the agenda for November 5, 1996; review of the Testing and Sampling Plan for Route 2, prepared by ITX:
William Phang
Basel Abukhater
Edward Lesswing
Nelio Rodrigues
Donald Larsen.

The meeting adjourned at 3:00 p.m. on November 4, 1996.

DAY 2

On Tuesday, November 5, 1996, an informal meeting resumed for the following purposes:

a) to complete review of the Testing and Sampling Plan;
b) to discuss the LTPP Test Protocols;
c) to review the forms for soil tests performed on samples obtained from Route 2 in September 1996; and,
d) to complete forms for coring of I-84 GPS site 095001 in Vernon, which took place in September 1996.

The following persons were in attendance at various portions of the meeting:
Basel Abukhater
Donald Larsen
Nelio Rodriques
John Henault
Robert Pion - ConnDOT Soils

1. Mr. Abukhater noted that test protocol 14A will not be performed due to a change by LTPP.

2. **Various changes were noted by Mr. Abukhater in the Testing and Sampling Plan. These changes will be finalized by ITX staff. Once the changes are made, a revised Testing and Sampling Plan will be sent to ConnDOT, by approximately November 15, 1996. When the revisions are received by ConnDOT, Mr. Rodrigues will revise ConnDOT's proposed testing plan accordingly.**

3. The Materials Sampling forms for Soil Tests prepared by Mr. Pion were reviewed with Mr. Abukhater. A few changes were suggested. Mr. Pion will make the changes and send two revised copies to ConnDOT Research. Upon receipt, Mr. Larsen will submit one copy of the SPS Materials Lab forms and the SPS Sampling forms to Mr. Phang. After review of the forms, ConnDOT will await instruction from ITX on the disposal of the test samples. **WE ARE NOT TO DISPOSE OF THE SAMPLES UNTIL WE HAVE RECEIVED APPROVAL TO DO SO FROM IVAN PECNIK.**

4. A set of Field Sampling forms was completed by Mr. Abukhater for the Vernon GPS site coring. A copy of the forms will be included with the cores to be shipped to Atlanta, one via cover letter and one inside the crate with the cores. A copy of the cover letter without the forms is to be sent to Mr. Phang. ConnDOT will ship the cores within the next two weeks.

5. Mr. Rodrigues will prepare a list of protocol questions to be submitted to Mr. Phang. Mr. Abukhater was not familiar enough with the protocols to provide feedback on our questions.

6. Mr. Abukhater will be notified when the ConnDOT pre-construction meeting is scheduled. He will provide copies of all the field sampling forms required during construction at the meeting.

Day 2 of the meeting ended at 3:00 p.m. on November 5, 1996.

Superminutes11596.doc

Copy to BA
EL

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

2800 BERLIN TURNPIKE, P.O. BOX 317546
NEWINGTON, CONNECTICUT 06131-7546
Phone: (860) 258-0372

NOV 29 1996

FILE # 13.7.9

ORIGINAL

November 22, 1996

Dr. William A. Phang
LTPP North Atlantic Principal Investigator
ITX Stanley Ltd.
415 Lawrence Bell Drive
Suite 3
Amherst, New York 14221-7805

Dear Dr. Phang:

Subject: Preconstruction Sampling and Testing

Enclosed for your review is a draft table on the subject. If we have overlooked anything, please add or make changes as you deem necessary. Please respond with your concurrence or comments no later than November 27, 1996. Thank you.

Very truly yours,

Charles E. Dougan

Charles E. Dougan, Ph.D., P.E.
Manager of Research and Materials
Bureau of Engineering and Highway Operations

Enclosure

cc: Ivan J. Pecnik - LTPP North Atlantic Regional Engineer

Pre-construction Sampling and/or Testing Remaining to be Performed
as of November 21, 1996
for Route 2, SPS 9A, 090900
(Proj. 28-185) /1/

Activity	**Data Obtained**	**No. of Tests**	**Agency Performing**	**Time Required**	**Lane Closure/ 2/**	**Schedule (during week begins)**
Stake out permanent boundaries at start of each section *	Permanent Reference	6 sites	ConnDOT Research	½ day	no	April 7
ARAN DATA Collection	grade, cross slope, roughness, geometry, rutting, film	continuous sample at all 6 sites	ConnDOT Photolog	½ day	no	March 31
Manual Distress Survey *	Cracking, patching, etc.	continuous sample of all 6 sites	ITX-Stanley	2 days	yes	April 7
Nuclear Density **	pavement density	3 per section at all 6 sites	ConnDOT Lab	1 day	yes	March 31
Cores for density **	differential pavement density between wheel paths and non- wheel paths	9 per section at all 6 sites (outside of the 500 ft monitoring section at station -250)	ConnDOT Lab	2 days	yes	March 31
Friction Testing	Surface Friction Numbers	continuous sample at all 6 sites (approx 2 tests per 500 ft section will result)	ConnDOT Research	½ day	no	March 31
Falling Weight Deflectometer *	Deflections	6 sites	ITX-Stanley	2 days	yes	April 7
Profilometer	Profile, roughness	6 sites	ITX-Stanley	½ day	no	April 7
Post-milling Manual Distress Survey	Cracking, patching etc.	continuous sample of all 6 sites	ConnDOT Research? ITX ?	3 hr per site, for 6 sites	yes	?

spspretest.doc

/1/ - weather permitting, all work to be completed by April 18, 1997, *except* post-milling distress survey.

/2/ - all lane closures provided by Franklin garage

* - can be performed simultaneously

** - can be performed simultaneously

COPY

CC. BA.

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

FEB 04 1997

FILE # 13-07-9

2800 BERLIN TURNPIKE, P.O. BOX 317546
NEWINGTON, CONNECTICUT 06131-7546
Phone: (860) 258-0372/FAX 258-0399
OFFICE OF RESEARCH AND MATERIALS

January 29, 1997

Mr. Edward P. Lesswing
Co-Principal Investigator
LTPP North Atlantic
ITX Stanley, Limited
415 Lawrence Bell Drive, Suite 3
Amherst, New York 14221-7805

Dear Mr. Lesswing:

Subject: Clarification of Agency Laboratory Testing for Mixture Verification

Mr. Nelio Rodrigues from this office met with Mr. Basel Abukhater, your representative, on December 3, 1996. During the course of this meeting, it was stated that the references to SPS protocols in the "The Materials Sampling and Testing Requirements (MSTR) revised Nov.,1996" require modification to conform to AASHTO materials standards and protocols.

It was apparent that the SPS protocols are essentially identical to the AASHTO references with the exception that the protocols are performed on <u>core specimens</u> or <u>extracted aggregate/binder</u>. Figure 1 is a table presenting a revised MSTR which could be changed to specify the appropriate AASHTO test procedures, shown in Figure 2, for mixture verification. In my opinion, to reflect the tests performed by a department of transportation laboratory for mixture verification, the AASHTO test procedures in Figure 2 should be specified.

FIGURE 1

Table No.	SPS PROTOCOL					
4	P11	P12	P14	P22	P23	P25
5	P2	P3	P5			
6	P2	P3	P4	P14		
7	P2	P3	P4	P5	P14	
16	P11	P12				
17	P22	P23	P25			
18	P2	P3	P5			
18 (cont)	P2	P3	P5			
19	P2	P3	P5			
19 (cont)	P2					
20	P2	P3	P4	P14		
20 (cont)	P2	P3	P4	P14		
21	P2	P3	P4	P14		
21 (cont)	P2	P3	P4	P14		

FIGURE 2

AASHTO TEST PROCEDURE	SPS Ref	Description
AASHTO T 166-93	P-2	Bulk Specific Gravity of Compacted Mold
AASHTO T 209-94	P-3	Maximum Specific Gravity of HMA
AASHTO T 164-94	P-4	Extraction and Binder Content
AASHTO T 283-89	P-5	Resistance of Compacted HMA to Moisture Damage
AASHTO T 85-91	P-11	Specific Gravity of Extracted Coarse Aggregate
AASHTO T 84-94	P-12	Specific Gravity of Extracted Fine Aggregate
AASHTO T 30-93	P-14	Gradation of Extracted Aggregate
AASHTO T 170-93	P-21	Abson Recovery of HMA
AASHTO T 49-93	P-22	Penetration of Asphalt Binder
AASHTO T 228-94	P-23	Specific Gravity of Asphalt Binder
AASHTO T 201-94	P-25	Kinematic Viscosity of Asphalt Binder

If you have any questions about this information, they may be directed to Mr. Keith R. Lane, Assistant Manager of Materials Testing, at this office. His telephone number is (860) 258-0321.

Very truly yours,

Charles E. Dougan

Charles E. Dougan, Ph.D., P.E.
Manager of Research and Materials
Bureau of Engineering and
Highway Operations

ITX Stanley

FAX MEMORANDUM

TO:	Jonathon Groeger - PCS/Law ~~310~~/210-5032 301
FROM:	Ed Lesswing
DATE:	8 February 1997
REFERENCE:	Connecticut SPS-9A **FILE: 50451219-13.07.9**
NO. OF PAGES:	**17**

This is a follow-up to our conversation of this A.M. I have enclosed a copy of the letter that we received from the Connecticut Department of Transportation.

Also enclosed are the Materials Sampling and Testing Plan Tables referred to in the letter. We would appreciate your thoughts on Dr. Dougan's suggestion.

Should you need additional information please advise.

Ed Lesswing
LTPP Co-Principal Investigator

Attachment

cc: I.J.Pecnik, P.E., RE-NARO, w/o attachment
W.A. Phang, P.I.-NARO, w/o attachment
B. Abukhater, NARO, w/o attachment

ITX Stanley Ltd 415 Lawrence Bell Drive, Suite 3 Amherst. New York 14221-7805 Ph (716)632-0804, Fax (716)632-4808

TECHNICAL MEMORANDUM

TO:	Charles Dougan - CT DOT
FROM:	Bill Phang
DATE:	4 March 1997
REFERENCE:	SPS-9A Project - RAP Test Sections **FILE: 50451231-13.07.9**

Enclosed is a copy of NCAT's Implementation Note 4 (Fall '96) on selecting the virgin PG asphalt for use with a specific RAP binder using Superpave binder specification criteria for rutting and a proposed alternative for fatigue.

Could this process be used in the SPS-9A project in Colchester, CT?

William A. Phang
LTPP Principal Investigator

Attachment

cc: D. Ingberg, RE-NCRO
I.J. Pecnik, P.E., RE-NARO
E. Lesswing, NARO
B. Abukhater, NARO

ITX Stanley Ltd 415 Lawrence Bell Drive, Suite 3 Amherst, New York 14221-7805 Ph (716)632-0804, Fax (716)632-4808

TECHNICAL MEMORANDUM

ITX Stanley

TO:	Dr. Charles Dougan - CT DOT Mr. Don Larson - CT DOT
FROM:	Bill Phang
DATE:	6 March 1997
REFERENCE:	SPS-9A In-Pavement Instrumentation **FILE: 50451231-13.07.9**

In response to a question by Mr. Don Larson concerning the use of pavement surface temperature data from a Road Weather Information System (RWIS) installation for the SPS-9A instead of the in-pavement instrumentation suggested for the SPS-9A, Mr. Monte Symons of the FHWA-LTPP Division had the following comments:-

1) There is now sufficient evidence to be able to confidently predict critical low pavement temperatures from the air temperature. The high temperature used in the PG binder selection process is also based on air temperature (highest 7-day average).

   So only air temperatures, high and low daily temperatures, are sufficient to be able to verify the PG asphalt selection process.

2) If high and low daily temperature records can be obtained from the RWIS installation, then the in-pavement SPS-9A temperature probe installation would be redundant.

It is understood from Mr. Larson that an RWIS installation is planned to be installed at the SPS-9A site.

William A. Phang
LTPP Principal Investigator

cc: I.J.Pecnik, P.E., RE-NARO
M. Symons, FHWA-LTPP
E. Lesswing, NARO
A. Lopez, FHWA-LTPP
B. Abukhater, NARO

ITX Stanley Ltd 415 Lawrence Bell Drive, Suite 3 Amherst New York 14221-7805 Ph (716)632-0804, Fax (716)632-4808

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

2800 BERLIN TURNPIKE, P.O. BOX 317546
NEWINGTON, CONNECTICUT 06131-7546
Phone: (860) 258-0371/FAX 258-0399
OFFICE OF RESEARCH AND MATERIALS
280 WEST STREET, ROCKY HILL, CONNECTICUT 06067

November 14, 1997

Dr. William A. Phang
LTPP North Atlantic Principal Investigator
ITX Stanley, Ltd.
415 Lawrence Bell Drive - Suite 3
Amherst, New York 14221 7805

Dear Dr. Phang:

Subject: Testing Method for Core Samples

This letter is to notify you of a concern which exists when performing the recommended Abson recovery on the forty-eight cores extracted from SPS-9A Project 090900, SR2, eastbound and westbound.

This project had six separate monitored sections. Each section requires eight cores to be extracted for analysis. Part of this analysis is to perform an extraction using trichloroethylene, a hazardous (carcinogen) solvent.

According to the plans submitted, four cores are taken within fifteen feet of each other at the beginning and another four cores at the end of each monitored section. With the knowledge that a truckload of hot mix asphalt places 100-120 feet of pavement, there is a very high likelihood that the binder of each of the four-core sets came from one truckload with the same binder.

The SPS testing requirements state that the eight cores are to be individually extracted, and an Abson recovery distillation performed only to recombine the AC binder to a homogeneous sample. A sample is then taken and applicable tests performed.

We believe that this sampling procedure may be excessive. Our recommendation is to randomly select two cores from each monitor section: one from the beginning portion and one from the end portion. This will require only twelve Abson recovery distillations to be performed in total, a more desirable amount.

Enclosed is a testing plan on how we propose to perform this work. Please review the plan and let us know whether this is acceptable.

If you have any questions about the information, they may be directed to Mr. Nicholas Corona, Supervising Materials Testing Engineer at this office. His telephone number is (860) 258-0326.

Very truly yours,

Keith Lane

Keith R. Lane, P.E.
Assistant Manager of Materials Testing
Bureau of Engineering and
Highway Operations

Enclosure

TESTING PLAN FOR CORES

115 g	approximate amount extracted from each core
x 2	cores per section
230 g	Available for testing

1-85 g Sample

-perform all penetration tests

1-60 g Sample

- perform specific gravity

1-85 g Sample

- perform all viscosity tests
- perform all DSR tests
- perform all BBR creep stiffness tests

Note: Direct tension equipment is not currently available and this test will not be performed.

ITX Stanley

14 November 1997
File: 50451319-13.07.9

Office of Research & Materials
Connecticut Dept. of Transportation
280 West Street
Rocky Hill, Connecticut 06067

Attention: Mr. Keith Lane

Dear Mr. Lane:

Reference: SPS-9 Project 090900, SR 2, Colchester, CT
Testing Method for Core Samples

This is in response to your fax of November 12, 1997 relative to the above. We find your proposed plan acceptable. We do have a question relative to the direct tension test. Could this test be performed by another lab for the Connecticut DOT?

Sincerely,

ITX Stanley Ltd
Pavement Management Systems Division

Ed Lesswing

Ed Lesswing
LTPP Co-Principal Investigator

Enclosure

cc: D. Larsen, CT DOT
W.A. Phang, P.I.-NARO
B. Abukhater, NARO

ITX Stanley Ltd. 415 Lawrence Bell Drive Suite 3 Amherst NY 14221-7805 Ph: (716) 632-0804 Fax. (716) 632-4808

Stanley Technology Group

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

2800 BERLIN TURNPIKE, P.O. BOX 317546
NEWINGTON, CONNECTICUT 06131-7546
Phone: (860) 258-0371
Office of Research and Materials
280 West Street
Rocky Hill, CT 06067

DEC 09 1997
FILE # 13-07.9
BA, BP

December 4, 1997

Mr. Ed Lesswing
LTPP Co-Principal Investigator
ITX Stanley, Ltd.
415 Lawrence Bell Dr. - Suite 3
Amherst, New York 14221-7805

Dear Mr. Lesswing:

Subject: Direct Tension Test

This is in response to your November 14, 1997 letter. Our understanding is that the direct tension machine presently exists only in prototype form and is not widely available. This testing could be performed when the equipment becomes readily available.

Our intention is to save enough binder to be able to perform the direct tension test at a later time. We will tightly seal the binder in 3 oz. tins and keep them in a freezer at -23°C until a later date. We hope this is satisfactory for providing the data you require.

If you have any questions, please contact Mr. Nicholas R. Corona, Supervising Materials Testing Engineer, at (860) 258-0326.

Very truly yours,

Keith R. Lane, P.E.
Director of Research and Materials
Bureau of Engineering and
Highway Operations

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
m e m o r a n d u m

Subject: *Notice of Award*
Project No.: 28-185
F.A.P. No. NH-32(150)

Date: November 6, 1996

To: Mr. Michael E. Lavallee
District Engineer-Dist. # 2
Bureau of Engineering and Highway Operations

From: Sebastian A. Cianci 3099
Trans. Manager of Contracts
Bureau of Finance and Administration

The contract for the subject project has been awarded. Enclosed are three (3) copies of the Contract, Set-Aside Nominated Subcontractor Form(s), Contract Schedule of Progress, Anticipated Source of Materials, Payment bond, Performance bond and the Insurance Certificate.

Date of Award: November 5, 1996

Contractor: Soneco/Northeastern, Inc.
185 South Rd., Groton, CT 06340

Bonding Co.: Lumbermens Mutual Casualty Co.
Long Grove, IL 60049

Agent/Bond No.: David N. Clinton/3S900491-00

Contract Amount: $3,137,961.60

Description: Resurfacing, Bridge and Safety Improvements on Connecticut Route 2 in Various Towns.

Insurance Company: Transcontinental Ins. Co.
CNA Plaza, Chicago, IL 60685

Transportation Ins. Co.
CNA Plaza, Chicago, IL 60685

Wayne R. Carlson/wrc
cc: A. Gruhn-E. Lescoe (Triplicate of the Contract, Source of Materials & Time Chart)
S. Barton-W. Stark
B. Smith-C. Bard-C. Holden
R. Haley-P. Holewa
E. R. Munroe
C. Dougan-K. Lane
W. H. Coughlin
A. Keating
C. Cooper-T. Dicioccio (DBE/SBE Office of Construction's Approval Form)
G. Hayes
J. Raccio
E. Fijol
W. Seery
J. A. Misbach
D. Campbell
M. L. Weidl
Employment Resources Development Agency
Labor Department- State of Connecticut
One Chane Inc.
Pall B. Oushana-Project File

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State of Connecticut
Department of Transportation
Bid Analysis

ACE 303 REV 3/90

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ADMINISTRATION-CONTRACT SECTION

VARIOUS
FEDERAL PROJECT NO. NH-32(150) STATE PROJECT NO. 28- 185
RESURFACING, BRIDGE & SAFETY
IMPROVEMENTS ON CONN ROUTE 2

SHEET 1

BIDS RECEIVED: AUGUST 28, 1996
NO. OF BIDDERS - 3

ITEM NO	DESCRIPTION	UNIT	QUANTITY	SONECO/NORTHEASTERN INC. 06-0542651		CARDI CORP. 05-0314973		TILCON CONNECTICUT INC 06-1035087	
				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
0201001A	CLEARING AND GRUBBING	L.S.		83,000.00	83,000.00	6,500.00	6,500.00	10,000.00	10,000.00
0202524A	REMOVAL OF BITUMINOUS WEARING SURFACE	S.Y.	876	4.50	3,942.00	3.25	2,847.00	6.00	5,256.00
0202529	CUT BITUMINOUS CONCRETE PAVEMENT	L.F.	500	2.00	1,000.00	1.75	875.00	2.00	1,000.00
0202533A	REMOVAL OF EXISTING CURBING	L.F.	36,800	.40	14,720.00	.10	3,680.00	.50	18,400.00
0304000A	PROCESSED AGGREGATE	TON	600	25.40	15,240.00	19.00	11,400.00	25.00	15,000.00
0406022	BITUMINOUS CONCRETE - CLASS 2	TON	19,700	29.10	573,270.00	33.00	650,100.00	34.00	669,800.00
0406077	BITUMINOUS CONCRETE - CLASS 12	TON	50	84.00	4,200.00	110.00	5,500.00	50.00	2,500.00
0406096A	BITUMINOUS CONCRETE CLASS 1 OR 2 HANDWORK	TON	100	69.25	6,925.00	110.00	11,000.00	100.00	10,000.00
0406237	MATERIAL FOR TACK COAT	GAL.	14,400	1.00	14,400.00	1.00	14,400.00	1.50	21,600.00
0406296A	MILLING	S.Y.	286,900	.59	169,271.00	.90	258,210.00	.90	258,210.00
0406440A	SUPERPAVE VIRGIN	TON	8,600	30.87	265,482.00	37.00	318,200.00	44.50	382,700.00
0406450A	SUPERPAVE ALTERNATE VIRGIN	TON	6,950	31.36	217,952.00	37.00	257,150.00	44.50	309,275.00
0406460A	SUPERPAVE RAP	TON	9,400	30.80	289,520.00	37.00	347,800.00	42.50	399,500.00
0406470A	SUPERPAVE ALTERNATE RAP	TON	7,500	31.60	237,000.00	37.00	277,500.00	42.50	318,750.00
0406480A	CLASS 1 VIRGIN	TON	9,250	31.47	291,097.50	33.00	305,250.00	44.50	411,625.00
0406490A	CLASS 1 RAP	TON	8,800	32.04	281,952.00	38.00	334,400.00	42.50	374,000.00
0406999A	ASPHALT ADJUSTMENT COST ESTIMATED COST	EST.		40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
0507791	REBUILD CATCH BASIN	EA.	6	1,275.00	7,650.00	650.00	3,900.00	1,200.00	7,200.00
0507801	CONVERT CATCH BASIN TO TYPE ''C'' CATCH BASIN	EA.	136	500.00	68,000.00	625.00	85,000.00	850.00	115,600.00
0507812	CONVERT CATCH BASIN TO TYPE ''C'' CATCH BASIN DOUBLE GRATE TYPE I	EA.	1	800.00	800.00	1,200.00	1,200.00	2,000.00	2,000.00
0507814	CONVERT CATCH BASIN TO TYPE ''TYPE C-L'' CATCH BASIN DOUBLE GRATE - TYPE I	EA.	4	800.00	3,200.00	1,200.00	4,800.00	2,000.00	8,000.00
0507821	CONVERT CATCH BASIN TO TYPE ''C-L'' CATCH BASIN	EA.	8	660.00	5,280.00	750.00	6,000.00	850.00	6,800.00

State of Connecticut
Department of Transportation
Bid Analysis

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ADMINISTRATION-CONTRACT SECTION

K75

FEDERAL PROJECT NO. NH-32 150 STATE PROJECT NO. 28- 185

SHEET 2

BIDS RECEIVED NO. OF BIDDERS - 3				SONECO/NORTHEASTERN INC. 06-0542651		CARDI CORP. 05-0314973		TILCON CONNECTICUT INC 06-1035087	
ITEM NO	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
0601196A	VARIABLE DEPTH PATCH	C.F.	3	675.00	2,025.00	950.00	2,850.00	600.00	1,800.00
0601317A	PARTIAL DEPTH PATCH	C.F.	200	40.40	8,080.00	100.00	20,000.00	200.00	40,000.00
0601604A	ASPHALTIC PLUG EXPANSION JOINT SYSTEM	LF	176	70.00	12,320.00	68.00	11,968.00	70.00	12,320.00
0602001	DEFORMED STEEL BARS	LB.	300	.67	201.00	1.15	345.00	2.00	600.00
0653001	CLEAN EXISTING CATCH BASIN	EA	247	64.80	16,005.60	25.00	6,175.00	65.00	16,055.00
0707001	MEMBRANE WATERPROOFING WOVEN GLASS FABRIC	S.Y.	876	12.00	10,512.00	12.00	10,512.00	12.00	10,512.00
0815093A	BITUMINOUS CONCRETE PARK CURB	L.F.	36,800	1.50	55,200.00	1.50	55,200.00	1.80	66,240.00
0910001	METAL BEAM RAIL TYPE R-B	L.F.	1,025	11.50	11,787.50	12.50	12,812.50	12.00	12,300.00
0910151	METAL BEAM RAIL TYPE MD-I	L.F.	238	12.00	2,856.00	13.00	3,094.00	12.00	2,856.00
0910158	METAL BEAM RAIL TYPE MD-I SYSTEM 4	L.F.	25	30.00	750.00	32.50	812.50	24.00	600.00
0910164	METAL BEAM RAIL TYPE MD-I SYSTEM 2	L.F.	19	15.00	285.00	16.00	304.00	14.00	266.00
0910165	METAL BEAM RAIL TYPE MD-I SYSTEM 3	L.F.	19	20.00	380.00	21.00	399.00	20.00	380.00
0910201	METAL BEAM RAIL TYPE R-I	L.F.	138	7.00	966.00	7.75	1,069.50	8.00	1,104.00
0911102	MD-I END ANCHORAGE TYPE I	EA	2	650.00	1,300.00	510.00	1,020.00	500.00	1,000.00
0911908	R-I END ANCHORAGE BURIED TYPE	EA.	2	650.00	1,300.00	700.00	1,400.00	500.00	1,000.00
0911923	R-B END ANCHORAGE-TYPE I	EA	2	550.00	1,100.00	425.00	850.00	500.00	1,000.00
0912503	REMOVE METAL BEAM RAIL	L.F.	200	2.00	400.00	1.25	250.00	1.50	300.00
0912508	RESET RAIL ANCHORAGE	EA.	32	200.00	6,400.00	400.00	12,800.00	380.00	12,160.00
0912601A	RESET METAL BEAM RAIL TYPE R-I	L.F.	2,750	5.00	13,750.00	3.50	9,625.00	4.70	12,925.00
0912605A	RESET METAL BEAM RAIL TYPE R-I SYSTEM 2	L.F.	76	7.00	532.00	7.00	532.00	7.00	532.00
0912607A	RESET METAL BEAM RAIL TYPE R-I SYSTEM 3	L.F.	76	10.00	760.00	14.50	1,102.00	10.00	760.00
0912608A	RESET METAL BEAM RAIL TYPE R-I SYSTEM 4	L.F.	50	12.00	600.00	10.00	500.00	10.50	525.00

State of Connecticut
Department of Transportation
Bid Analysis

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ADMINISTRATION-CONTRACT SECTION

K75

FEDERAL PROJECT NO. NH-32 150 STATE PROJECT NO. 28- 185

SHEET 3

BIDS RECEIVED NO. OF BIDDERS - 3				SONECO/NORTHEASTERN INC. 06-0542651		CARDI CORP. 05-0314973		TILCON CONNECTICUT INC 06-1035087	
ITEM NO	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
0912609A	RESET METAL BEAM RAIL TYPE R-I SYSTEM 5	L.F.	50	15.00	750.00	20.00	1000.00	13.50	675.00
0912611A	RESET METAL BEAM RAIL TYPE R-I SYSTEM 6A	L.F.	50	30.00	1500.00	36.00	1800.00	25.00	1250.00
0912615A	RESET THREE CABLE GUIDE RAILING I-BEAM POST	L.F.	16800	4.00	67200.00	2.80	47040.00	4.00	67200.00
0918001	THREE-CABLE GUIDE RAILING I BEAM POSTS	L.F.	225	5.00	1125.00	5.90	1327.50	7.50	1687.50
0918011	END ANCHORAGE-TYPE I	EA.	1	650.00	650.00	750.00	750.00	700.00	700.00
0969001A	CONSTRUCTION FIELD OFFICE TYPE A	MO.	7	1000.00	7000.00	1000.00	7000.00	100.00	700.00
0970002	TRAFFICMEN STATE POLICE OFFICERS	HOUR	1000	43.00	43000.00	47.25	47250.00	50.00	50000.00
0971001A	MAINTENANCE AND PROTECTION OF TRAFFIC	L.S.		30000.00	30000.00	30000.00	30000.00	75000.00	75000.00
0975002	MOBILIZATION	L.S.		3850.00	3850.00	224000.00	224000.00	100000.00	100000.00
0976002	BARRICADE WARNING LIGHTS - HIGH INTENSITY	DAY	600	1.00	600.00	.90	540.00	1.00	600.00
0980001A	CONSTRUCTION STAKING	L.S.		4000.00	4000.00	17000.00	17000.00	20000.00	20000.00
0981100	42'' TRAFFIC CONE	EA	50	40.00	2000.00	32.00	1600.00	40.00	2000.00
1130000	HIGH MOUNTED INTERNALLY ILLU-MINATED FLASHING ARROW	DAY	150	25.00	3750.00	15.00	2250.00	10.00	1500.00
1131001	CHANGEABLE MESSAGE SIGN	DAY	150	90.00	13500.00	75.00	11250.00	100.00	15000.00
1205201A	TYPE DE-1 DELINEATOR	EA.	650	22.00	14300.00	26.00	16900.00	17.50	11375.00
1205202A	TYPE DE-2 DELINEATOR	EA.	40	28.20	1128.00	31.00	1240.00	19.00	760.00
1206013	REMOVAL OF EXISTING SIGNING	L.S.		2500.00	2500.00	1000.00	1000.00	1000.00	1000.00
1209002	PAINTED PAVEMENT MARKINGS 6 WHITE	L.F.	44000	.10	4400.00	.09	3960.00	.10	4400.00
1209005	PAINTED PAVEMENT MARKINGS 4'' WHITE	L.F.	155000	.10	15500.00	.09	13950.00	.10	15500.00

State of Connecticut
Department of Transportation
Bid Analysis

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ADMINISTRATION-CONTRACT SECTION

K75

FEDERAL PROJECT NO. NH-32 150 STATE PROJECT NO. 28- 185

SHEET 4

BIDS RECEIVED
NO. OF BIDDERS - 3

ITEM NO	DESCRIPTION	UNIT	QUANTITY	SONECO/NORTHEASTERN INC. 06-0542651 UNIT PRICE	AMOUNT	CARDI CORP. 05-0314973 UNIT PRICE	AMOUNT	TILCON CONNECTICUT INC 06-1035087 UNIT PRICE	AMOUNT
1209007	PAINTED PAVEMENT MARKINGS 4'' YELLOW	L.F.	155000	.10	15500.00	.09	13950.00	.10	15500.00
1209008	PAINTED PAVEMENT MARKINGS 8'' WHITE	L.F.	7000	.11	770.00	.11	770.00	.12	840.00
1209512A	6'' WHITE PREFORMED PLASTIC PAVEMENT MARKINGS CLASS I	L.F.	21700	2.55	55335.00	2.55	55335.00	2.55	55335.00
1209801A	4'' WHITE TYPE I EPOXY RESIN PAVEMENT MARKINGS	L.F.	76400	.18	13752.00	.18	13752.00	.20	15280.00
1209802A	4'' YELLOW TYPE I EPOXY RESIN PAVEMENT MARKINGS	L.F.	76200	.18	13716.00	.18	13716.00	.20	15240.00
1209805A	8'' WHITE TYPE I EPOXY RESIN PAVEMENT MARKINGS	L.F.	3300	.33	1089.00	.33	1089.00	.35	1155.00
1209812A	EPOXY RESIN PAVEMENT MARKINGS SYMBOLS AND LEGEND	SF	294	2.50	735.00	2.50	735.00	2.50	735.00
1220002A	CONSTRUCTION SIGNS - WIDE ANGLE RETROREFLECTIVE SHEETING	SF	1000	9.50	9500.00	15.00	15000.00	10.00	10000.00
1700000A	TRAINING	EA.	3	800.00	2400.00	800.00	2400.00	800.00	2400.00

State of Connecticut
Department of Transportation
Bid Analysis

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ADMINISTRATION-CONTRACT SECTION

K75

FEDERAL PROJECT NO. NH-32 150 STATE PROJECT NO. 28- 185

SHEET 5

BIDS RECEIVED NO. OF BIDDERS - 3				SONECO/NORTHEASTERN INC. 06-0542651		CARDI CORP. 05-0314973		TILCON CONNECTICUT INC 06-1035087	
ITEM NO	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
1806200A	TYPE D PORTABLE IMPACT ATTENUATION SYSTEM UNDER ITEM NO. 1806200 ''TYPE D PORTABLE IMPACT ATTENUATION SYSTEM '' THE CONTRACTOR BASES HIS BID ON ONE OF THE FOLLOWING FURNISHING AND USE OF PORTABLE IMPACT ATTENUATION SYSTEMS OPPOSITE WHICH HE HAS SHOWN HIS UNIT PRICE AND AMOUNT								
	1. FURNISHING AND USE OF TYPE D-1 PORTABLE IMPACT ATTENUATION SYSTEM	HR	1200			40.00	48000.00		
	2. FURNISHING AND USE OF TYPE D-2 PORTABLE IMPACT ATTENUATION SYSTEM	HR	1200	40.00	48000.00			60.00	72000.00
1808201A	IMPACT ATTENUATOR REPLACEMENT PARTS	LS		8000.00	8000.00	4350.00	4350.00	4000.00	4000.00
1808210A	IMPACT ATTENUATOR	EA	2	5500.00	11000.00	5900.00	11800.00	5000.00	10000.00
					3137961.60		3710087.00		4154283.50
LOW BIDDER	SONECO/NORTHEASTERN, INC. - - - - - 3137961.60								

SONECO/NORTHEASTERN
INCORPORATED

P O BOX S • 185 SOUTH ROAD • GROTON, CONNECTICUT 06340

TEL 203-445-2457 • 800-421-3564

FAX 203-448-1038

S ECO/NORTHEASTERN, INC. MONTVILLE JOB MIX FORMULAS May 27, 1997

S ENS	1	2	3	4	5,5A,5B	8	12
um #200	5	5	5	3	2	5	5
um # 50	17	21	22	14	--	35	27
600 um # 30	27	31	33	--	8	55	43
nm # 8	44	50	58	34	20	85	70
nm # 4	55	70	74	40	82	--	88
6.3 mm 1/4"	--	--	--	--	--	97	--
9.5 mm 3/8"	74	95	95	52	100	100	100
1 5 mm 1/2"	92	100	100	--	--	--	--
1 0 mm 3/4"	95	--	--	72	--	--	--
25.0 mm 1"	100	--	--	--	--	--	--
mm 2"	--	--	--	100	--	--	--

n	AC-20	AC-20	AC-20	AC-20	MC-250A	MC-3000	AC-20
%Bitumen	5.4	6.4	7 1	4.4	6.4	7.4	8.0
Pr . %	5.1	6.1	6.9	4.1	6.2	7.1	7.8
Mix Temp.	300F 150C	300F 150C	300F 150C	300F 150C	160F 70C	300F 150C	300F 150C

B men Source
Trimount, P.O Box 1103, New Haven, CT
John J Hudson, One Service Rd , Providence, RI
American Asphalt Products, One Service Rd., Providence, RI
Trevex Transport, 16 Alexander Rd., Bloomfield, CT 06002
N & L Williams Co , Inc , 478 Shelton Ave , Hamden, CT 06517

Ag egate Source
Soneco/Northeastern, Inc , Caroline Rd , Montville, CT
Soneco/Northeastern, Inc., Rixtown Rd., Griswold, CT
Kobyluck, Oxoboxo Dam Rd., Montville, CT.
Rawson, 190 Munoin, Putnam, CT
Tilcon Connecticut, Wauregan, CT

Class 5A contains 6 lbs of polyporpolene fibers per ton and class 5B contains 2 5 lbs of polyester fibers per ton.

Classes 1,2,& 4 may contain up to 30% R A P after receiving approval The bitumen percent will be adjusted automatically to compensate for bitumen contained in the R A P The bitumen type will be AC-10 when 15% to 30% R A P is used

Rec'd 9.3. 10-14-97 K.F.

Copy

Section 02

Route 2 - Soneco
Virgin PG 64 - 28 Mix Design Summary - AB 3V

Optimum Asphalt Content
5.2%

Coarse Aggregate Angularity
100%

Fine Aggregate Angularity
45 5%

Sand Equivalent
90

Gsb of Blended Aggregate
2 635

Gsa of Blended Aggregate
2.687

% Flat & Elongated
0.20%

Blended Aggregate Gradation		
Sieve (mm)		% Passing
19 0		100
12 5		97 2
9 5		83.9
4 75		56 4
2 36		41.5
1 18		33 0
0 600		25 1
0 300		16 5
0 150		9 0
0 075		3 5

Properties @ N Design	
VMA	15 0%
VFA	73%
0 075/Pbe	0 73

Note: This mix contains the same aggregate structure as the Revised Virgin PG 64 - 22 AB 3V mix.

19m

Mixture Summary Report for Varying %AC Analysis

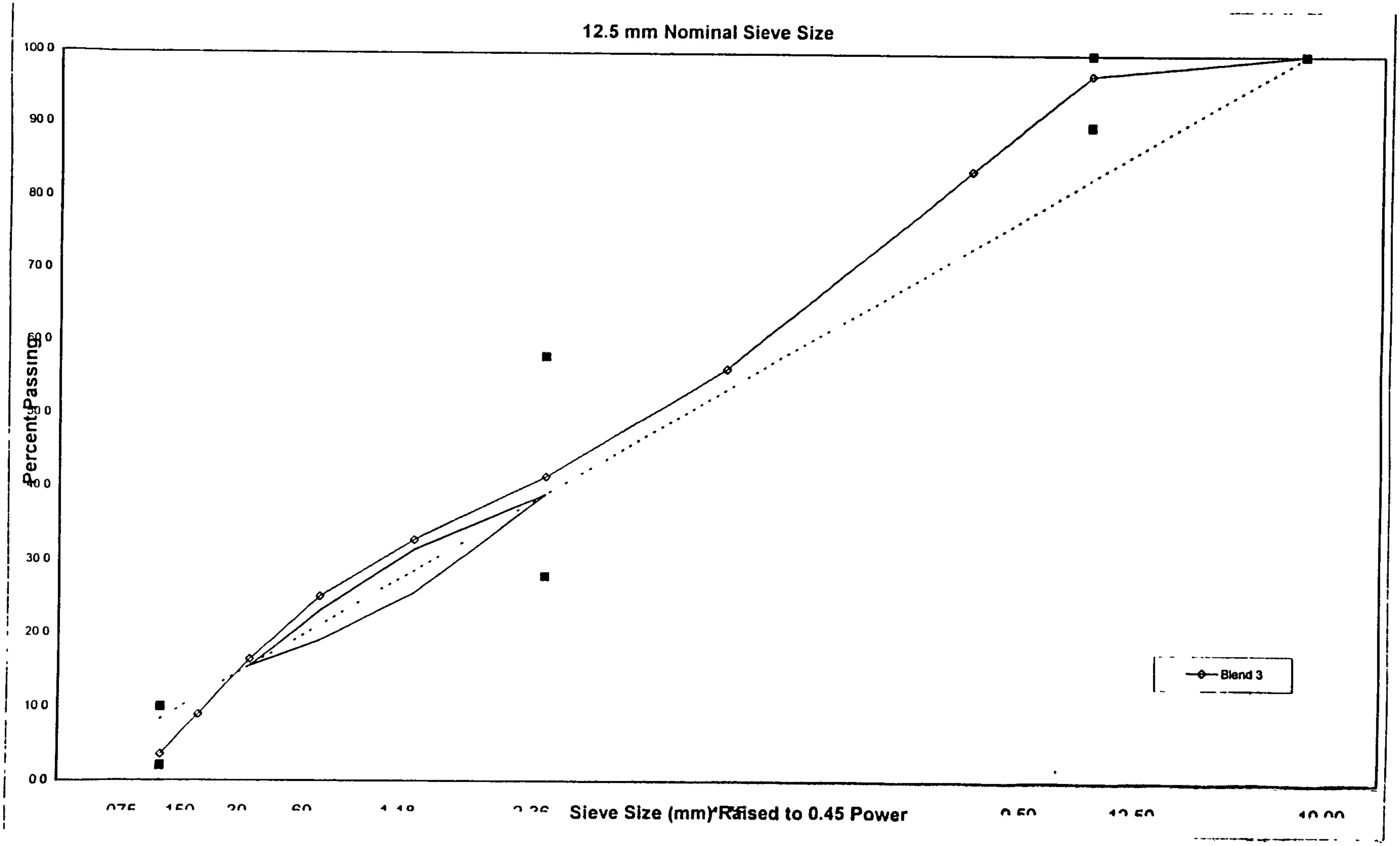
Project Name:	Route 2 - Soneco - Virgin PG 64	**N Initial:**	7
Workbook Name:	Route 2 Virgin 64-281.xls	**N Design:**	86
Technician:	Jim Mahoney	**N Max:**	134
Date:	4/11/97	**Nom. Sieve Size:**	12.5 mm
Asphalt Grade:	64-28	**Compaction Temperature:**	143 °C
		Mixture Temperature:	155°C
Design ESAL's (millions):	3	**Depth from Surface (mm):**	50
Design Temperature:	38°C	**Mold Size:**	150 mm

Property	Results: AB 3V - 4.5%	AB 3V - 5.0%	AB 3V - 5.5%	Blend 4	Criteria
%AC	4.5	5.0	5.5		
%Air Voids (V_a)	6.8	4.7	3.2		4.0 %
%VMA	16.0	15.1	14.8		14.0 % Min.
%VFA	57.7	68.9	78.4		65.0 % Min. 78.0 % Max.
Dust/Asphalt Ratio	0.9	0.8	0.7		0.6-1.2 %
Max Specific Gravity (G_{mm})	2.486	2.470	2.453	0.000	
Bulk Specific Gravity (G_{mb})	2.345	2.379	2.402		
$\%G_{mm}$ @ N_{ini}	85.7	87.5	88.6		89.0 % Max.
$\%G_{mm}$ @ N_{max}	94.3	96.3	97.9		98.0 % Max.
Effective Sp Gravity of Blend (G_{se})	2.663	2.666	2.667		---
Sp Gravity of Binder (G_b)	1.030	1.030	1.030		---
Sp. Gravity of Aggregate (Gs_b)	2.635	2.635	2.635		---

Route 2 - Virgin PG 64-28 - Stone Sand 3

Project Name: Virgin PG 64-28 Route 2
Technician: J Mahoney
Date. 4/13/97

Filename: Revised Route 2 Submission Virgin 64-22 xls
Description: 0
Nominal Sieve Size: 12 5 mm



Connecticut Advanced Pavement Lab

Route 2 - Virgin PG 64-28 - Stone Sand 3

Project Name. Virgin PG 64-28 Route 2
Technician: J Mahoney
Date: 4/13/97

Filename: Revised Route 2 Submission Virgin 64-22 xls
Description:
Nominal Sieve Size: 12 5 mm

	Blend 3V	Blend 2V	Blend 3V	Blend 4	Blend 5
1/2 inch			25 0		
3/8 inch			25 0		
Natural			25 0		
Stone Sand3			25 0		
	0 00	0 00	100 00	0 00	0 00

Sieve Size	Blend 1V	Blend 2V	Blend 3V	Blend 4	Blend 5
19 00	0 0	0 0	100 0	0 0	0 0
12.50	0 0	0 0	97 2	0 0	0 0
9.50	0 0	0 0	83 9	0 0	0 0
4 75	0 0	0 0	56 4	0 0	0 0
2.36	0 0	0 0	41 5	0 0	0 0
1.18	0 0	0 0	33 0	0 0	0 0
0 60	0 0	0 0	25 1	0 0	0 0
0.30	0 0	0 0	16 5	0 0	0 0
0.150	0 0	0 0	9 0	0 0	0 0
0 075	0 0	0 0	3 5	0 0	0 0

Stockpiles								
1/2 inch	3/8 inch	Natural	Stone Sand3					
100 0	100 0	100 0	100 0					
88 6	100 0	100 0	100 0					
36 2	99 2	100 0	100 0					
4 5	32 9	88 3	100 0					
3 3	5 4	77 2	80 1					
2 8	3 9	65 5	59 7					
2 5	3 2	51 5	43 2					
2 2	2 6	35 7	25 3					
1 7	2 0	21 8	10 4					
1 0	1 3	8 4	3 4					

						Specs.
Gsb			2 635			
Gsa			2 687			
% Absorption			0 66			
Sand Equiv.			89 5			40% min
%Flat and Elongated Particles			0 2			10% max
%Fine Ag Ang			45 5			40% min
%Course Agg. Ang (1 or more)			100 0			75% min
%Course Agg. Ang (2 or more)			100 0			---% min
Va (assumed)	4 0	4 0	4 0	4 0	4 0	
Pb (assumed)	5 0	5 0	5 0	5 0	5 0	
Gse (est.)			2 635			
Ws			2 229			
Vba (est.)			0 000			
Vbe (est)	0 102	0 102	0 102	0 102	0 102	
Pbi (est)			4 5			

1/2 inch	3/8 inch	Natural	Stone Sand3					
2 607	2 599	2 718	2 619					
2 636	2 638	2 777	2 700					
0 42	0 57	0 79	0 87					
		80 0	99 0					
0 4	0 0							
		43 9	47 0					
100 0	100 0							
100 0	100 0							

Absorption Multiplier	
Gb	1 030
Traffic (million ESAL's)	2 9
Depth from Surface (mm)	50 0

Hudson Laboratories
One Service Road
Providence, RI 02905

Project: Soneco **Sample:** D-97 **ID:** D-97 **Tech.:** KAM
Supplier: Irving **Barge:** – **Date:** 4-10-97

Original Binder

Flash Point Temp.: Min 230C: 302

Rotational Viscosity Max. 3 PaS (3000 cP)

Spindle: SC4-21 Model: RV RPM: 20

Test Temp. @ 135C:	0.421	Test Temp. @ 175C:	0.083
Torque:	16.9	Torque:	3.6
Shear Rate:	18.6	Shear Rate:	18.6
Hold Time:	20	Hold Time:	20
Stress:	78.3	Stress:	16.4
Compaction Range, C:	142 - 147	Mixing Range, C:	153 - 159

Dynamic Shear G*/sin(delta), min. 1.00 kPa, Test Temp. @ 10 rad/s, C

Ang. Freq., rad/s:	9.987	Time, s:	101.2	Temp., C:	64
Strain, %:	11.992	Osc. Stress, Pa:	130 2	G*/sin(delta), kPa:	1.088
G*:	1087	delta:	87.41	Fail Temp., C:	64.7

RTFO Residue

Percent Change, 1.00 Mass Loss, %: ______

Dynamic Shear G*/sin(delta), min. 2.20 kPa, Test Temp. @ 10 rad/s, C

Ang. Freq., rad/s:	9.987	Time, s:	76.13	Temp., C:	64
Strain, %:	10.111	Osc. Stress, Pa:	239 9	G*/sin(delta), kPa:	2.39
G*:	2379	delta:	84.5	Fail Temp., C:	64.6

PAV Aging 20 hrs. @ 2.07 MPa

Dynamic Shear G*sin(delta), max. 5000 kPa, Test Temp. @ 10 rad/s, C

Ang. Freq., rad/s:	9.987	Time, s:	101.1	Temp., C:	19.1
Strain, %:	0.9934	Osc. Stress, Pa:	65860	G*/sin(delta), kPa:	4643
G*:	6638	delta:	44.38	Fail Temp., C:	18.4

Creep Stiffness S, max 300 Mpa, Test Temp. @ 60s, C, m-value, min. 0.300

m-value:	0.302	Test Temp., C:	-18	Force, N:	0.974
Meas. Stiffness, kPa	277	Est. Stiffness, kPa:	277	diff (%):	0.2

Regression Constants
a = 2.85 b = -0.159 c = -0.0402 R^2 = 0.9999

Performance Grade 64-28

Certified by: Karissa Mooney

Section 03

Route 2 - Soneco
Virgin PG 64 - 22 REVISED Mix Design Summary -AB 3V

Optimum Asphalt Content
5.2%

Coarse Aggregate Angularity
100%

Fine Aggregate Angularity
45.5%

Sand Equivalent
90

Gsb of Blended Aggregate
2.635

Gsa of Blended Aggregate
2.687

Blended Aggregate Gradation		
Sieve (mm)		% Passing
19.0		100
12.5		97 2
9.5		83 9
4 75		56 4
2 36		41.5
1.18		33 0
0.600		25 1
0.300		16.5
0.150		9.0
0.075		3.5

% Flat & Elongated
0.20%

Properties @ N Design	
VMA	14 8%
VFA	74%
0.075/Pbe	0 72

029

Mixture Summary Report for Varying %AC Analysis

Project Name:	Route 2 - Soneco AB 3V Aspha	**N Initial:**	7
Workbook Name:	AB 3V Project WB.xls	**N Design:**	86
Technician:	J. Mahoney	**N Max:**	134
Date:	4/5/97	**Nom. Sieve Size:**	12.5 mm
Asphalt Grade:	62 - 22	**Compaction Temperature:**	145 °C
		Mixture Temperature:	155°C
Design ESAL's (millions):	3	**Depth from Surface (mm):**	50
Design Temperature:	38°C	**Mold Size:**	150 mm

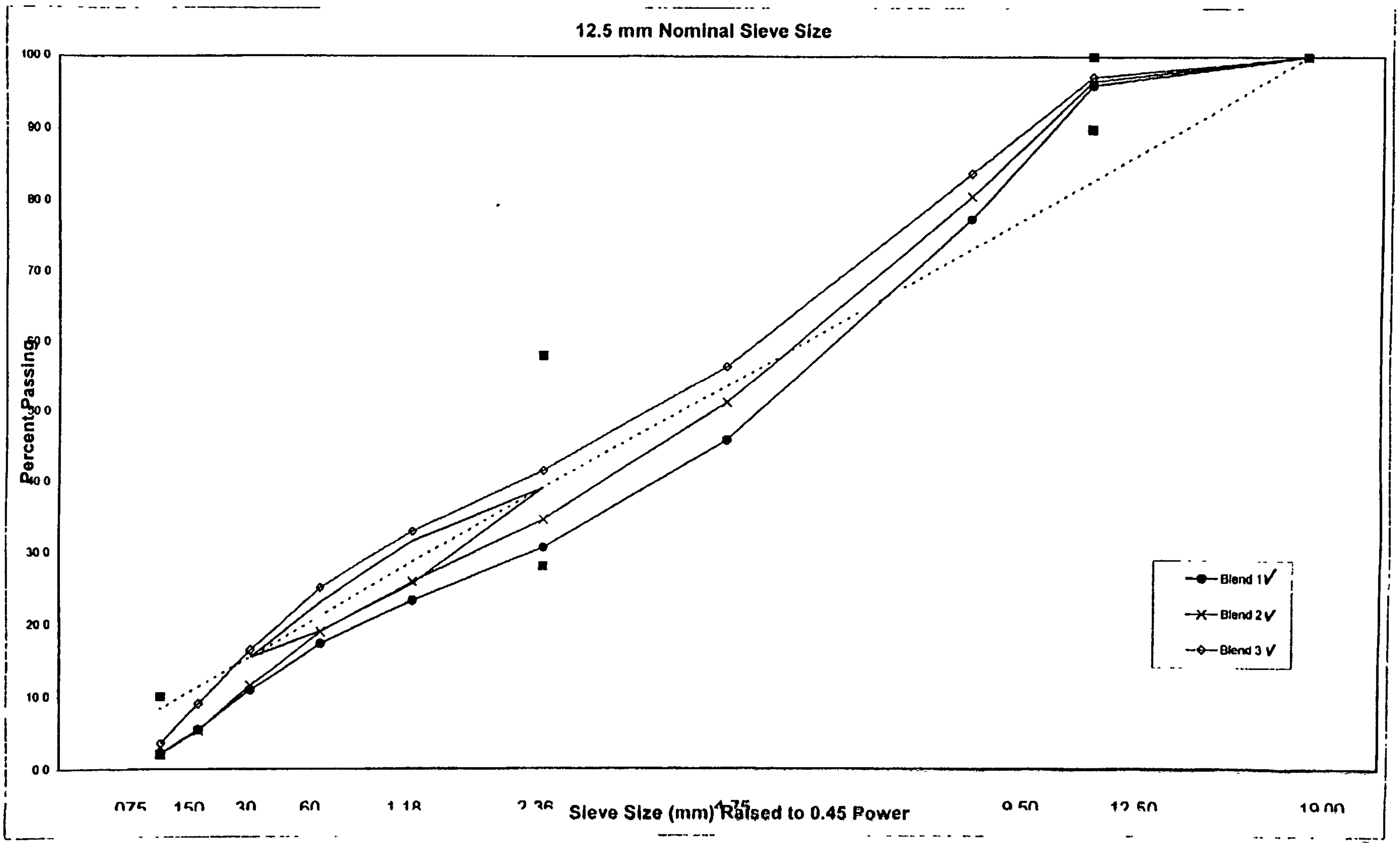
	Results				
Property	**AB 3V 4.5%**	**AB 3V 5.0%**	**AB 3V 5.5%**	**Blend 4**	**Criteria**
%AC	4 5	5.0	5.5		
%Air Voids (V_a)	6 0	4 5	3.3		4.0 %
%VMA	15.4	15 0	14.8		14.0 % Min.
%VFA	61 1	70.3	77.6		65.0 % Min. 78.0 % Max.
Dust/Asphalt Ratio	0.8	0.8	0.7		0.6-1.2 %
Max. Specific Gravity (G_{mm})	2.482	2.468	2.458	0.000	
Bulk Specific Gravity (G_{mb})	2.358	2.385	2.404		
%G_{mm} @ N_{ini}	86.8	87.8	88.6		89.0 % Max.
%G_{mm} @ N_{max}	95.0	96 6	97.8		98.0 % Max.
Effective Sp. Gravity of Blend (G_{se})	2.659	2.664	2.674		---
Sp. Gravity of Binder (G_b)	1.030	1.030	1.030		---
Sp. Gravity of Aggregate (Gs_b)	2.635	2.635	2.635		—

AV binder

Route 2 - Aggregate Gradation Trials - Virgin PG 64-22 - New Stone Sand

Project Name: Virgin PG 64-22 Route 2
Technician: J Mahoney
Date: 3/27/97

Filename: Route 2 - New Stone Sand Mix1.xls
Description: 0
Nominal Sieve Size: 12.5 mm



Route 2 - Aggregate Gradation Trials - Virgin PG 64-22 - New Stone Sand

Project Name: Virgin PG 64-22 Route 2
Technician: J. Mahoney
Date: 3/27/97

Filename: Route 2 - New Stone Sand Mix1 xls
Description:
Nominal Sieve Size: 12 5 mm

	Blend 3V	Blend 2V	Blend 3V	Blend 4	Blend 5
1/2 inch	35 0	30 0	25 0		
3/8 inch	30 0	30 0	25 0		
Natural	5 0	0 0	25 0		
Stone Sand3	30 0	40 0	25 0		
	100 00	100 00	100 00	0 00	0 00

Sieve Size	Blend 1V	Blend 2V	Blend 3V	Blend 4	Blend 5
19.00	100 0	100 0	100 0	0 0	0 0
12.50	96 0	96 6	97 2	0 0	0 0
9.50	77 4	80 6	83 9	0 0	0 0
4.75	45 9	51 2	56 4	0 0	0 0
2.36	30 7	34 7	41 5	0 0	0 0
1.18	23 3	25.9	33 0	0 0	0 0
0 60	17 4	19 0	25 1	0 0	0 0
0.30	10 9	11 6	16 5	0 0	0 0
0.150	5 4	5 3	9 0	0 0	0 0
0.075	2 2	2 1	3 5	0 0	0 0

Stockpiles							
1/2 inch	3/8 inch	Natural	Stone Sand3				
100 0	100 0	100 0	100 0				
88 6	100 0	100 0	100 0				
36 2	99 2	100 0	100 0				
4.5	32 9	88.3	100 0				
3 3	5 4	77.2	80 1				
2 8	3 9	65 5	59 7				
2 5	3 2	51 5	43 2				
2 2	2 6	35.7	25 3				
1 7	2 0	21 8	10 4				
1.0	1 3	8.4	3 4				
2 607	2.599	2 718	2.619				
2 636	2 638	2 777	2 700				
0 42	0.57	0.79	0 87				
		80 0	99 0				
0 4	0 0						
		43 9	47 0				
100 0	100 0						
100 0	100 0						

	Blend 1V	Blend 2V	Blend 3V	Blend 4	Blend 5	Specs.
Gsb	2 614	2 609	2 635			
Gsa	2 662	2 662	2 687			
% Absorption	0 62	0 65	0.66			
Sand Equiv.	96 3	99 0	89 5			40% min.
%Flat and Elongated Particles	0 2	0 2	0 2			10% max
%Fine Ag. Ang.	46 6	47 0	45.5			40% min
%Course Agg. Ang (1 or more)	100 0	100 0	100 0			75% min
%Course Agg. Ang. (2 or more)	100 0	100 0	100 0			---% min
Va (assumed)	4 0	4.0	4 0	4 0	4 0	
Pb (assumed)	5 0	5 0	5 0	5 0	5 0	
Gse (est.)	2.614	2 609	2 635			
Ws	2 213	2 210	2 229			
Vba (est.)	0 000	0 000	0 000			
Vbe (est.)	0 102	0 102	0 102	0 102	0 102	
Pbl (est.)	4 5	4 5	4 5			

Absorption Multiplier Gb	1.030
Traffic (million ESAL's)	2.9
Depth from Surface (mm)	50.0

AG

Rec'd at Dist 2 meeting
6/27/97 Sam Soneco

Route 2 - Soneco
RAP PG 64 - 28 Mix Design Summary - AB 11R

Optimum Asphalt Content
5 0%

Coarse Aggregate Angularity
100%

Fine Aggregate Angularity
45 1%

Sand Equivalent
90

Gsb of Blended Aggregate
2.665

Gsa of Blended Aggregate
2.724

Blended Aggregate Gradation		
Sieve (mm)		% Passing
19.0		100
12.5		96 8
9 5		77
4 75		44 7
2.36		31 2
1.18		24 9
0 600		19 2
0 300		12 9
0 150		7 2
0 075		3 1

% Flat & Elongated
0 20%

Asphalt Content of RAP
5 2%

Gsb of RAP
2 828

Percent of RAP by Total Mix Weight
20%

Properties @ N Design	
VMA	14 3%
VFA	72 8%
0 075/Pbe	0 7

Note: Gsb of Aggregate Blend Calculated using the Gsb of RAP

Mixing and Compaction Temperatures are based on PG 64 - 22 Temperatures

RAP Percentages are based on Total Weight of Mix

Virgin Binder added was PG 58-30

4% Virgin Binder Must be added to Mix

Nam

Mixture Summary Report for Varying %AC Analysis

Project Name:	RAP 64 - 28 Route 2 - Soneco	**N Initial:**	7
Workbook Name:	RAP 64-28 Project xls	**N Design:**	86
Technician:	Jim Mahoney	**N Max:**	134
Date:	6/24/97	**Nom. Sieve Size:**	12.5 mm
Asphalt Grade:	58-30	**Compaction Temperature:**	145 °C
		Mixture Temperature:	155°C
Design ESAL's (millions):	3	**Depth from Surface (mm):**	50
Design Temperature:	38°C	**Mold Size:**	150 mm

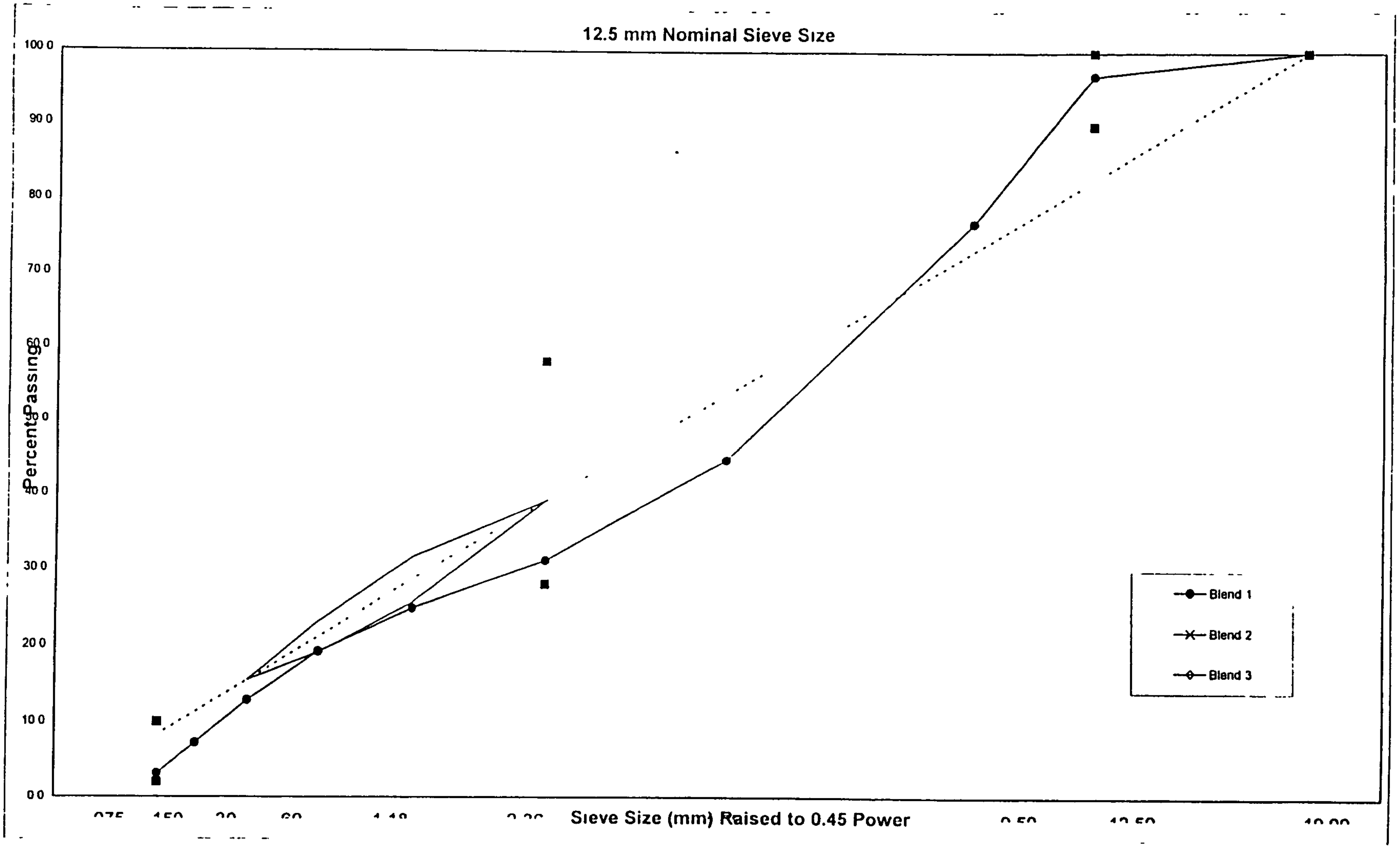
Property	Results: 11R - 4.5%	11R - 5.0%	11R - 5.5%	Blend 4	Criteria
%AC	4 5	5.0	5 5		
%Air Voids (V_a)	5 2	3 9	2 3		4 0 %
%VMA	14 5	14 3	13 9		14 0 % Min
%VFA	63 8	72 8	83 7		65 0 % Min 78 0 % Max
Dust/Asphalt Ratio	0 8	0 7	0 6		0 6-1.2 %
Max Specific Gravity (G_{mm})	2 519	2 501	2 484		
Bulk Specific Gravity (G_{mb})	2 416	2 436	2 459		
$\%G_{mm}$ @ N_{ini}	86 5	87 2	88.6		89.0 % Max.
$\%G_{mm}$ @ N_{max}	95 9	97.4	99 0		98.0 % Max.
Effective Sp Gravity of Blend (G_{se})	2 703	2 705	2 707		---
Sp Gravity of Binder (G_b)	1 030	1.030	1.030		---
Sp Gravity of Aggregate (Gs_b)	2 665	2 665	2.665		---

J.M.

Route 2 - Aggregate Gradation Trials - RAP PG 64-28

Project Name: RAP PG 64-28 Route 2
Technician: J Mahoney
Date: 6/24/97

Filename: RAP Grad 64 - 28 xls
Description: 0
Nominal Sieve Size: 12 5 mm



A-52

Route 2 - Aggregate Gradation Trials - RAP PG 64-28

Project Name: RAP PG 64-28 Route 2
Technician: J Mahoney
Date: 6/24/97

Filename: RAP Grad 64 - 28 xls
Description:
Nominal Sieve Size: 12 5 mm

	AB 11R	Blend 2	Blend 3	Blend 4	Blend 5
1/2 inch	25 0				
3/8 inch	25 0				
Natural	15 0				
Stone Sand3	15 0				
RAP	20 0				
	100 00	0 00	0 00	0 00	0 00

Sieve Size	AB 11R	Blend 2	Blend 3	Blend 4	Blend 5
19.00	100 0	0 0	0 0	0 0	0 0
12.50	96 8	0 0	0 0	0 0	0 0
9.50	77 0	0 0	0 0	0 0	0 0
4.75	44 7	0 0	0 0	0 0	0 0
2.36	31 2	0 0	0 0	0 0	0 0
1.18	24 9	0 0	0 0	0 0	0 0
0.60	19 2	0 0	0 0	0 0	0 0
0.30	12 9	0 0	0 0	0 0	0 0
0.150	7 2	0 0	0 0	0 0	0 0
0 075	3 1	0 0	0 0	0 0	0 0

	AB 11R	Blend 2	Blend 3	Blend 4	Blend 5	Specs.
Gsb	2 665					
Gsa	2 724					
% Absorption	0 78					
Sand Equiv.	89 5					40% min
%Flat and Elongated Particles	0 2					10% max
%Fine Ag. Ang	45 1					40% min
%Course Agg. Ang. (1 or more)	100 0					75% min
%Course Agg. Ang. (2 or more)	100 0					---% min
Va (assumed)	4 0	4 0	4 0	4 0	4 0	
Pb (assumed)	5 0	5 0	5 0	5 0	5 0	
Gse (est.)	2 665					
Ws	2 252					
Vba (est.)	0 000					
Vbe (est.)	0 102	0 102	0 102	0 102	0 102	
Pbl (est)	4 4					

Stockpiles							
1/2 inch	3/8 inch	Natural	Stone Sand3			RAP	
100 0	100 0	100 0	100 0			100 0	
88 6	100 0	100 0	100 0			98 1	
36 2	99 2	100 0	100 0			65 7	
4 5	32 9	88 3	100 0			35 4	
3 3	5 4	77 2	80 1			27.0	
2 8	3 9	65 5	59 7			22 0	
2 5	3 2	51 5	43 2			17 9	
2 2	2 6	35.7	25 3			12 6	
1 7	2 0	21 8	10 4			7 3	
1 0	1 3	8 4	3 4			4 0	
2 607	2 599	2 718	2 619			2 828	
2 636	2 638	2 777	2 700			2 943	
0 42	0 57	0 79	0 87			1 40	
		80 0	99 0				
0 4	0 0						
		43 9	47 0			44 5	
100 0	100 0						
100 0	100 0						

Absorption Multiplier Gb	1 030
Traffic (million ESAL's)	2 9
Depth from Surface (mm)	50 0

J.M.

RT2- RAP

Combined Aggregate Specific Gravity

Project	Route 2 Soneco	Mix No.		Date	3/11/97
Material/Stockpile ID		Technician	CD		
Lot No.	RAP				

Coarse Aggregate Portion

Percent of Aggregate Larger than 4.75	58.5
Bulk Specific Gravity	2.883
Apparent Specific Gravity	2.988
Absorption (%)	1 22

Fine Aggregate Portion

Percent of Aggregate Smaller than 4.75	41.5
Bulk Specfic Gravity	2 750
Apparent Specific Gravity	2.880
Absorption (%)	1 65

Combined Aggregate Gravities

Bulk Specific Gravity	2.828
Apparent Specific Gravity	2.91[illegible]
Absorption (%)	1.40

Ngn

'Actual Delivered by K. Wallace 5/20 @ 320

Copy

Route 2 - Soneco
RAP PG 64 - 22 Mix Design Summary - AB 11R

Optimum Asphalt Content
5.0%

Coarse Aggregate Angularity
100%

Fine Aggregate Angularity
45.1%

Sand Equivalent
90

Gsb of Blended Aggregate
2.691

Gsa of Blended Aggregate
2.724

Blended Aggregate Gradation		
Sieve (mm)		% Passing
19.0		100
12.5		96.8
9.5		77
4 75		44 7
2.36		31.2
1.18		24 9
0.600		19.2
0.300		12.9
0.150		7.2
0 075		3.1

% Flat & Elongated
0.20%

Asphalt Content of RAP
5.2%

Gse of RAP
2.981

Percent of RAP by Total Mix Weight
20%

Properties @ N Design	
VMA	15.1%
VFA	73%
0 075/Pbe	0.7

Note: Gsb of Aggregate Blend Calculated using the Gse of RAP

Mixing and Compaction Temperatures are based on PG 64 - 22 Temperatures

RAP Percentages are based on Total Weight of Mix

Virgin Binder added was PG 58-28

Final Grading of Recovered Asphalt PG 76-22

Mixture Summary Report for Varying %AC Analysis

Project Name:	Route 2 - Soneco RAP 64 - 22	**N Initial:**	7
Workbook Name:	RAP AB 11R Project 64-22.xls	**N Design:**	86
Technician:	J Mahoney	**N Max:**	134
Date:	5/5/97	**Nom. Sieve Size:**	12.5 mm
Asphalt Grade:	64 - 22	**Compaction Temperature:**	145 °C
		Mixture Temperature:	155°C
Design ESAL's (millions):	3	**Depth from Surface (mm):**	50
Design Temperature:	38°C	**Mold Size:**	150 mm

Property	Results: 11R - 4.5%	11R - 5.0%	11R - 5.5%	Blend 4	Criteria
%AC	4 5	5.0	5 5		
%Air Voids (V_a)	5 5	4.0	2 5		4.0 %
%VMA	15.5	15.1	14.6		14.0 % Min.
%VFA	64 6	73.3	83 2		65.0 % Min. 78.0 % Max.
Dust/Asphalt Ratio	0.7	0 7	0.6		0.6-1.2 %
Max. Specific Gravity (G_{mm})	2.519	2.506	2.492		
Bulk Specific Gravity (G_{mb})	2 413	2 438	2 462		
%G_{mm} @ N_{ini}	85 4	86 6	87 8		89.0 % Max.
%G_{mm} @ N_{max}	95 8	97.3	98 8		98.0 % Max.
Effective Sp. Gravity of Blend (G_{se})	2.703	2 711	2.717		---
Sp Gravity of Binder (G_b)	1.030	1 030	1.030		---
Sp Gravity of Aggregate (Gs_b)	2 691	2 691	2.691		---

RAP AB 11R Project 64-22

Project Name:	Route 2 - Soneco RAP 64 - 22	**N Initial:**	7
Workbook Name:	RAP AB 11R Project 64-22.xls	**N Design:**	86
Technician:	J. Mahoney	**N Max:**	134
Date:	5/5/97	**Nom. Sieve Size:**	12.5mm
Asphalt Grade:	64 - 22	**Design Temperature:**	38°C
Compaction Temp:	145°C	**Design ESAL's (millions):**	3

Blend	%AC	%Gmm @ N = 7 (corrected)	%Gmm @ N = 86 (corrected)	%Gmm @ N = 134 (corrected)	%Air Voids @ NDesign	%VMA @ NDesign
11R - 4.5%	4.5	85.4	94.5	95.8	5.5	15.5
11R - 5.0%	5.0	86.6	96.0	97.3	4.0	15.1
11R - 5.5%	5.5	87.8	97.5	98.8	2.5	14.6
Blend 4						

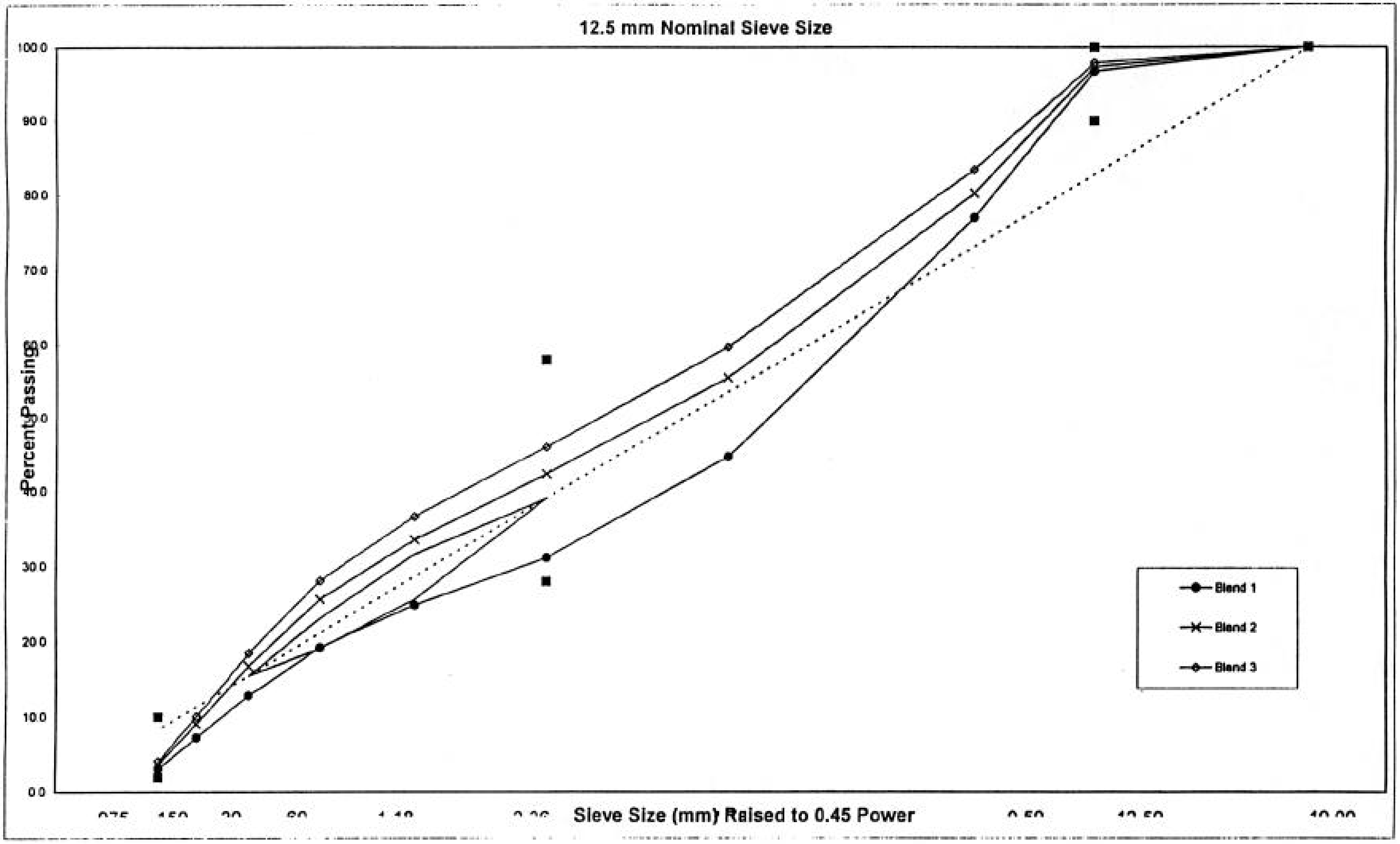
Blend	Estimated %AC @ 4% Va	Estimated %Gmm @ N = 7 (89% Max)	Estimated %Gmm @ N = 86	Estimated %Gmm @ N = 134 (98% Max)	Estimated %VMA @ NDesign (14 % Min)	Estimated %VFA @ NDesign (65 78%)
11R - 4.5%	5.1	86.9	96.0	97.3	15.2	73.7
11R - 5.0%	5.0	86.6	96.0	97.3	15.1	73.5
11R - 5.5%	4.9	86.3	96.0	97.2	14.8	72.9
Blend 4						

	11R - 4.5%	11R - 5.0%	11R - 5.5%	Blend 4
Ag Bulk Specific Gravity (Gsb)	2.691	2.691	2.691	
Percent Binder by wt. of mix (Pbi)	4.5	5.0	5.5	
Percent Aggregate (Ps)	95.5	95.0	94.5	
Specific Gravity of Binder (Gb)	1.030	1.030	1.030	
Fines (%Passing 0.075mm Sieve)	3.1	3.1	3.1	
Effective Specific Gravity (Gse)	2.703	2.711	2.717	
Effective % Binder (Pbe)	4.3	4.7	5.2	
Dust Proportion (0.6-1.2%)	0.7	0.7	0.6	

Route 2 - Aggregate Gradation Trials - RAP PG 64-22

Project Name: Virgin PG 64-22 Route 2
Technician: J. Mahoney
Date: 5/5/97

Filename: RAP Grad 64 - 22.xls
Description: 0
Nominal Sieve Size: 12.5 mm



D.M.

Route 2 - Aggregate Gradation Trials - RAP PG 64-22

Project Name: Virgin PG 64-22 Route 2
Technician: J. Mahoney
Date: 5/5/97

Filename: RAP Grad 64 - 22.xls
Description:
Nominal Sieve Size: 12.5 mm

	AB 11R	AB 2R	AB 3R	Blend 4	Blend 5
1/2 Inch	25.0	20.0	15.0		
3/8 Inch	25.0	15.0	15.0		
Natural	15.0	20.0	25.0		
Stone Sand3	15.0	25.0	25.0		
RAP	20.0	20.0	20.0		
	100.00	100.00	100.00	0.00	0.00

Sieve Size	AB 11R	AB 2R	AB 3R	Blend 4	Blend 5
19.00	100.0	100.0	100.0	0.0	0.0
12.50	96.8	97.3	97.9	0.0	0.0
9.50	77.0	80.3	83.5	0.0	0.0
4.75	44.7	55.6	59.8	0.0	0.0
2.36	31.2	42.3	46.0	0.0	0.0
1.18	24.9	33.6	36.7	0.0	0.0
0.60	19.2	25.7	28.1	0.0	0.0
0.30	12.9	16.8	18.5	0.0	0.0
0.150	7.2	9.1	10.1	0.0	0.0
0.075	3.1	3.7	4.1	0.0	0.0

	AB 11R	AB 2R	AB 3R	Blend 4	Blend 5	Specs.
Gsb	2.691	2.699	2.704			
Gsa	2.724	2.737	2.745			
% Absorption	0.78	0.83	0.84			
Sand Equiv.	89.5	90.6	89.5			40% min.
%Flat and Elongated Particles	0.2	0.2	0.2			10% max
%Fine Ag. Ang.	45.1	45.3	45.2			40% min
%Course Agg. Ang. (1 or more)	100.0	100.0	100.0			75% min
%Course Agg. Ang. (2 or more)	100.0	100.0	100.0			---% min
Va (assumed)	4.0	4.0	4.0	4.0	4.0	
Pb (assumed)	5.0	5.0	5.0	5.0	5.0	
Gse (est.)	2.691	2.699	2.704			
Ws	2.271	2.277	2.281			
Vba (est.)	0.000	0.000	0.000			
Vbe (est.)	0.102	0.102	0.102	0.102	0.102	
Pbi (est.)	4.4	4.4	4.4			

Stockpiles							
1/2 Inch	3/8 Inch	Natural	Stone Sand3			RAP	
100.0	100.0	100.0	100.0			100.0	
88.6	100.0	100.0	100.0			98.1	
36.2	99.2	100.0	100.0			65.7	
4.5	32.9	88.3	100.0			35.4	
3.3	5.4	77.2	80.1			27.0	
2.8	3.9	65.5	59.7			22.0	
2.5	3.2	51.5	43.2			17.9	
2.2	2.6	35.7	25.3			12.6	
1.7	2.0	21.8	10.4			7.3	
1.0	1.3	8.4	3.4			4.0	

2.607	2.599	2.718	2.619			2.981	
2.636	2.638	2.777	2.700			2.943	
0.42	0.57	0.79	0.87			1.40	
		80.0	99.0				
0.4	0.0						
		43.9	47.0			44.5	
100.0	100.0						
100.0	100.0						

Absorption Multiplier	
Gb	1.030
Traffic (million ESAL's)	2.9
Depth from Surface (mm)	50.0

Q.M.

Soundness of Aggregate by Use of Sodium Sulfate
AASHTO T104

Route 2 - Soneco
May 13, 1997

½ Inch Stone

	Weight before Test, g	% Loss after 5 Cycles
12.5 to 9.5 mm	1000.2	0.009999
9.5 to 4.75 mm	300.2	0.0707

Weighted Average Loss - 0.0320%

3/8 Inch Stone

	Weight before Test, g	% Loss after 5 Cycles
9.5 to 4.75 mm	300.1	0.218%

Natural Sand

	Weight before Test, g	% Loss after 5 Cycles
9.5 to 4.75 mm	300.0	1.875%

Recovered Binder Analysis for RAP 64 - 22

Binder was Recovered from Gyratory Specimen

Total Asphalt Content of Specimen - 5.0%

RAP Constituted 20% of Total Mix Weight

DSR on Recovered Asphalt (Rolling Thin Film Equivalent)

G*/sin(delta)	Limit	Temp. (C)
2.63 kPa	2.20 kPa	76

DSR on PAV Material

(G*)sin(delta)	Limit	Temp. (C)
4384 kPa	5000 kPa	25

Bending Beam Rheometer Results

ATS

Stiffness, kPa	Limit, kPa	m-value	Limit	Temp (C)
97473	300000	0.299	0.29	-12

Final Grade of Asphalt PG 76 - 22

0.9%

Hudson Laboratories
One Service Road
Providence, RI 02905

Project:	CA	**Sample:**	AC-10	**ID:**	1-10-97	**Tech.:**	KAM
Supplier:	Irving	**Barge:**	–	**Date:**	4-7-97		

Original Binder

Flash Point Temp.: **Min 230C:** 304

Rotational Viscosity **Max. 3 PaS (3000 cP)**

Spindle: SC4-21 Model: RV RPM· 20

Test Temp. @ 135C:	0.318	Test Temp. @ 175C:	0.068
Torque:	12.8	Torque:	2.8
Shear Rate:	18.6	Shear Rate:	18.6
Hold Time:	20	Hold Time:	20
Stress.	59.2	Stress:	12.8
Compaction Range,C:	136 - 141	Mixing Range, C:	147 - 153

Dynamic Shear G*/sin(delta), min. 1.00 kPa, Test Temp. @ 10 rad/s, C

Ang Freq., rad/s:	9.987	Time, s:	101	Temp., C:	58
Strain, %:	11.969	Osc. Stress, Pa:	167.9	G*/sin(delta), kPa:	1.407
G*:	1405	delta:	87.01	Fail Temp., C:	60.9

RTFO Residue

Percent Change, 1.00 Mass Loss, %: -0.11

Dynamic Shear G*/sin(delta), min. 2.20 kPa, Test Temp. @ 10 rad/s, C

Ang. Freq., rad/s·	9.987	Time, s:	75.96	Temp., C.	58
Strain, %:	10.116	Osc. Stress, Pa:	296.9	G*/sin(delta), kPa·	2.958
G*:	2943	delta:	84.16	Fail Temp., C:	60.3

PAV Aging 20 hrs. @ 2.07 MPa

Dynamic Shear G*sin(delta), max. 5000 kPa, Test Temp @ 10 rad/s, C

Ang. Freq., rad/s:	9.987	Time, s:	–	Temp., C·	16
Strain, %:	–	Osc. Stress, Pa:	–	G*/sin(delta), kPa:	–
G*:	–	delta:	–	Fail Temp., C:	15.2

Creep Stiffness S, max. 300 Mpa, Test Temp. @ 60s, C; m-value, min. 0.300

m-value:	0.336	Test Temp., C:	-18	Force, N:	0.982
Meas. Stiffness, kPa	194	Est. Stiffness, kPa:	193	diff (%):	0.35

Regression Constants
a = 2.76 b = -0.198 c = -0.0387 R^2 = 0.999853

Performance Grade 58-28

Certified by: Kaissa Mooney

F H W A - L T P P				STATE/PROVINCE:		CONNECTICUT				PROFILOMETER DATA COLLECTION				
I T X S L - N A R O				SPS EXPERIMENT:		9				AND PROCESSING SUMMARY				30-Apr-98
				SPS SECTION NO:		090900								Page 1/1

LTPP ID NUMBER (VISIT)	SURVEY DATE d-mmm-yy	IRI DATA COLLECTION SUMMARY Run Number 1	2	3	4	5	6	7	8	9	AVG IRI (m/km) left IRI	right IRI	both IRI	REHAB/ MAINT TYPE	REHAB/ MAINT DATE
090901														63mm Surf. OVL	CONST.
(090901SA)	9-Apr-97		1.322	1.312	1.306	1.277	1.261				1.225	1.366	1.296	25mm Lev. OVL	23-Jun-97
(090901SB)	28-Oct-97			1.010	1.004	1.030	1.003	1.022			0.952	1.074	1.014		
090902														63mm Surf. OVL	CONST.
(090902SA)	9-Apr-97		1.288	1.275	1.301	1.292	1.299				1.221	1.360	1.291	25mm Lev. OVL	15-Jul-97
(090902SB)	28-Oct-97	1.008	1.029	1.029	1.031	1.035					0.826	1.226	1.026		
090903														63mm Surf. OVL	CONST.
(090903SA)	9-Apr-97	1.545	1.568	1.607	1.546		1.617				1.514	1.640	1.577	25mm Lev. OVL	28-Jun-97
(090903SB)	28-Oct-97			1.024	1.032	1.051	1.052	1.037			1.112	0.965	1.039		
090960														63mm Surf. OVL	CONST.
(090960SA)	9-Apr-97	1.175		1.130		1.182	1.162		1.168		1.059	1.267	1.163	25mm Lev. OVL	7-Aug-97
(090960SB)	28-Oct-97		0.984	0 997	0.971		0.984	0.980			0.940	1.026	0.983		
090961														63mm Surf. OVL	CONST.
(090961SA)	9-Apr-97	1.745	1.689	1.711	1.729			1.742			1.731	1.715	1.723	25mm Lev. OVL	8-Sep-97
(090961SB)	28-Oct-97	0.937	0.963	0.943			0.954	0.956			0.902	0.998	0.951		
090962														63mm Surf. OVL	CONST.
(090962SA)	9-Apr-97	1.315	1.277	1.288	1.272	1.317					1.349	1.238	1.294	25mm Lev. OVL	12-Aug-97
(090962SB)	28-Oct-97			0.936	0.926	0.947	0.960	0.928			0.867	1.011	0.939		

FHWA-LTPP
ITXSL-NARO

FALLING WEIGHT DEFLECTOMETER DATA
COLLECTION AND PROCESSING SUMMARY

STATE / PROVINCE: CT / 090900
Name / Code No

FLEXIBLE PAVEMENTS

17-Apr-98
Page 1/1

SHRP ID	SURVEY DATE mm/dd/yy	MEAN VALUES FOR DROP HT 2 (mils) S1	S1 STD DEV	S7	S7 STD DEV	TEMPERATURE (mean) D1	(min/max) D1	EFFECTIVE SN	SN STD DEV	SUBGRADE MODULUS psi	MODULUS STD DEV psi	MODULUS OF TEST PIT NO. 1	2	COMMENT NUMBER
090901	4/8/97	4.96	0.74	1.39	0.13	59	53/64	8.63	0.70	28476	2473			
	10/28/97	3.26	0.27	0.75	0.07	54	54/54	9.77	0.43	53980	4367			
090902	4/8/97	4.66	0.48	1.83	0.21	78	74/81	9.59	0.45	21967	2777			
	10/28/97	2.61	0.11	0.68	0.03	58	57/58	10.80	0.24	58722	2771			
090903	4/8/97	5.19	1.14	1.28	0.30	76	72/79	8.37	0.65	32168	2510			
	10/29/97	2.55	0.32	0.64	0.11	43	41/45	10.68	0.43	63759	11097			
090960	4/9/97	3.72	0.57	1.00	0.07	50	48/52	9.35	0.86	38955	2525			
	10/29/97	2.90	0.35	0.65	0.05	54	51/57	10.10	0.67	62451	5074			
090961	4/9/97	4.57	0.88	1.32	0.18	66	60/72	8.97	0.82	30336	4082			
	10/29/97	3.47	0.48	0.71	0.07	54	53/54	9.41	0.68	56512	4786			
090962	4/9/97	6.49	1.59	1.48	0.15	77	76/78	7.74	0.92	26963	2809			
	10/30/97	3.49	0.53	0.87	0.06	51	44/57	9.71	0.75	46190	3205			

COMMENTS: Pavement thickness design values were used in FWDCHECK QA.

LTPP SPS Project Deviation Report Project Summary Sheet	State Code 0 9 Project Code 0 9 0 0

Project Classification Information

SPS Experiment Number: 9A	State or Province: CONNECTICUT
LTPP Region:	[X] North Atlantic [ ] North Central [ ] Southern [ ] Western
Climate Zone:	[ ] Dry-Freeze [ ] Dry-No Freeze [X] Wet-Freeze [ ] Wet-No Freeze
Subgrade Classification.	[ ] Fine Grain [X] Coarse Grain [ ] Active (SPS-8 Only)
Project Experiment Classification Designation (SPS 1, 2 and 8):	
Construction Start Date: 97-05-01	Construction End Date: 97-09-08

Deviation Summary

Site Location Deviations:	[X] No Deviations [ ] Minor Deviations [ ] Significant Deviations
Construction Deviations:	[ ] No Deviations [X] Minor Deviations [ ] Significant Deviations

Data Collection and Processing Status Summary

Inventory Data (SPS 5,6,7,9).	[X] Complete Submission [ ] Incomplete [ ] Data Not Available [ ] NA
Materials Data:	[X] All Scheduled Samples Obtained and Tested [ ] Incomplete/No Test Data
Construction Data:	[X] All Required Data Obtained [ ] Incomplete/Missing Data Elements
Historical Traffic Data:	[ ] All Required Historical Estimates Submitted (SPS 5,6,7,9) [ ] Required Estimates Not Submitted [X] NA
Traffic Monitoring Equipment:	[X] WIM Installed On-Site [ ] AVC Installed On-Site [ ] ATR Installed On-Site [ ] No Equipment Installed
Traffic Monitoring:	[X] Preferred [ ] Continuous [ ] Minimum [ ] Below Minimum [ ] Site Related
Traffic Monitoring Data:	[ ] Monitoring Data Submitted [X] No Monitoring Data Submitted
FWD Measurements:	[X] Preconstruction Tests Performed [ ] Construction Tests Performed [X] Post-construction Tests Performed
Profile Measurements:	[X] Preconstruction Tests Performed [X] Post-construction Tests Performed
Distress Measurements:	[X] Preconstruction Tests Performed [X] Post-construction Tests Performed
Maint. & Rehab. Data:	[X] Complete Submission [ ] Incomplete [ ] Data Not Available [ ] NA

Report Status

Materials Sampling and Test Plan:	[ ] Document Prepared [X] Final Submitted to FHWA
Construction Report:	[ ] Document Prepared [X] Final Submitted to FHWA
AWS: (SPS 1, 2, & 8)	[ ] AWS Installed [ ] AWS Installation Report Submitted to FHWA [ ] NA

Page 1 of 5 Preparer Basel Abukhater Date 98-06-30
1TXSL - NARO

LTPP SPS Project Deviation Report **Site Location Guidelines Deviations**	State Code 0 9 Project Code 0 9 0 0

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) ____

Site Location Guideline Deviation Comments

No Deviations.

Page 2 **of** 5 **Preparer** Basel Abukhater ITXSL - NARO **Date** 98-06-30

LTPP SPS Project Deviation Report Construction Guidelines Deviations	State Code 0 9 Project Code 0 9 0 0

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) ______

Construction Guidelines Deviation Comments

No Deviations.

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LTPP SPS Project Deviation Report Data Collection and Materials Sampling and Testing Deviations	State Code 09 Project Code 0900

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) ______

Data Collection & Material Sampling and Testing Deviation Comments

1) No rod and level elevation measurements were taken throughout the construction of this project. The only thickness measurements are from cores taken in the sampling areas.

2) Reheating time of the hot mix asphalt concrete samples before gyratory compaction should not exceed 30 minutes. All the samples were reheated to more than 30 minutes.

3) A California type Profilograph test was not performed on the test sections as is required by the guidelines. Only the ConnDOT ARAN and the LTPP Profilometer™ were used to measure the profile.

4) Deflection and Profile survey monitoring were supposed to be performed 1-3 months and less than two months, respectively, after construction is completed. The deflection survey on the east bound was delayed two weeks and the profile survey on the east bound was delayed six weeks due to the fact that the construction on the west bound lanes finished close to two months after the east bound lanes.

Page 4 of 5 Preparer Basel Abukhater ITXSL-NARO Date 98-06-30

LTPP SPS Project Deviation Report **Other Deviations**	State Code 09 Project Code 0900

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) ______

Other Deviation Comments

No other deviations.

Page 5 of 5 Preparer Basel Abukhater
ITXSL - NARO
Date 98-06-30

APPENDIX B

Photographs

Photo 1 - Pre Construction Granular Base, Subbase, and Subgrade Bulk and Moisture Sampling

Photo 2 - Pre Construction Shoulder Auger Probes for Depth to Rigid Layer Determination

Photo 3 - Existing Surface After Milling

Photo 4 - Existing Surface After Milling Showing Transverse and Longitudinal Cracks on the Milled Surface

Photo 5 - Blaw-Knox Model PF-180H Paver Laying Surface Mix on the SPS-9A Travel Lane

Photo 6 - Hyster Roller on the Surface Layer of the SPS-9A Sections

Photo 7 - Hot Mix Bulk Sampling from the Paver Hopper for Immediate Gyratory Compaction at the Lab

Photo 8 - Storing the Hot Mix Field Samples in Insulated Cooler Boxes for Immediate Transfer to the Lab for Gyratory Compaction

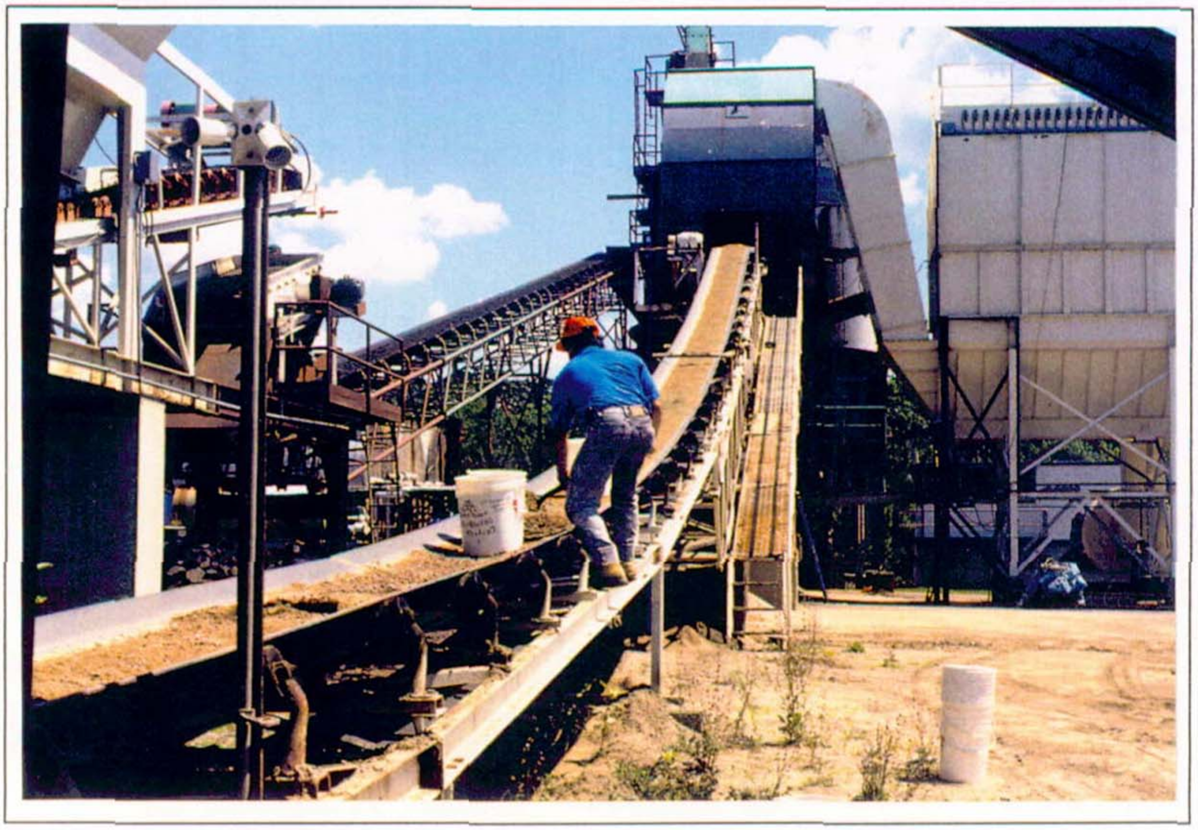

Photo 9 - Sampling of the Combined Aggregate from the Conveyor Belt at the Asphalt Plant

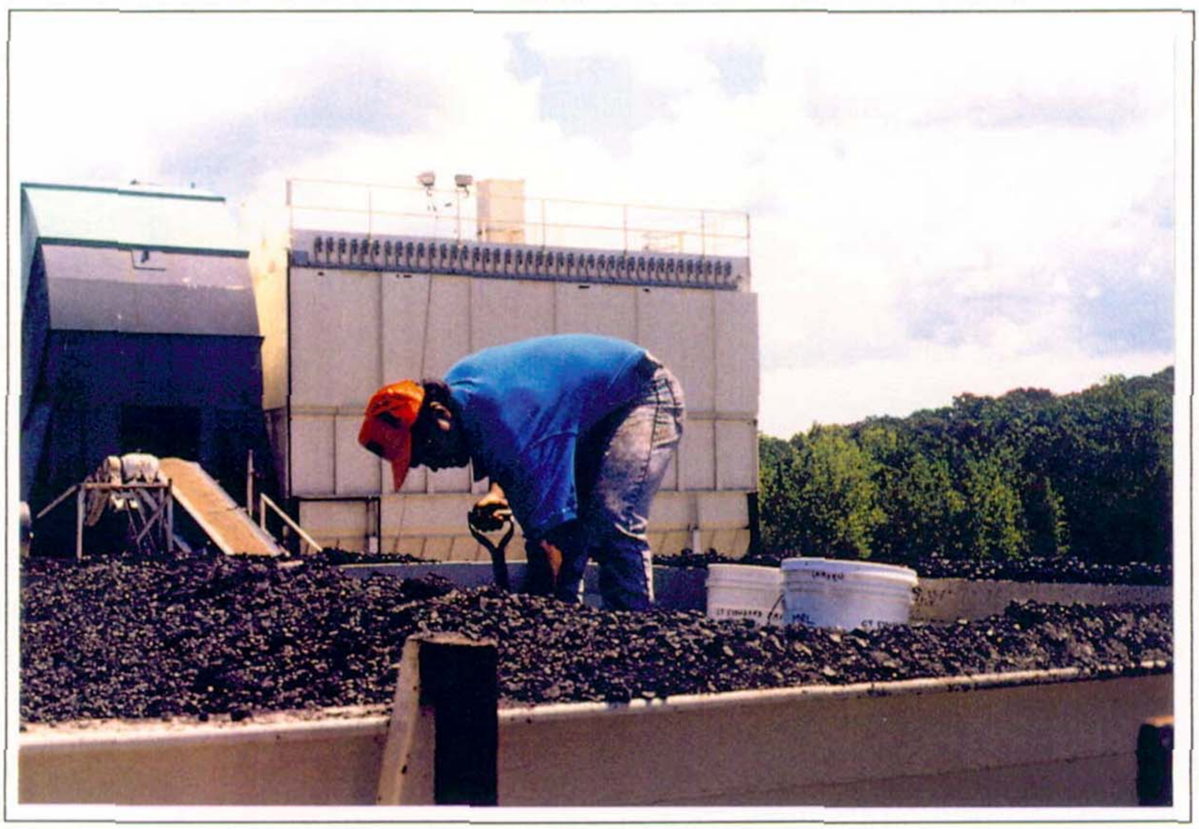

Photo 10 - Sampling of the RAP Aggregate from the Storage Bin at the Asphalt Plant

Photo 11 - Sampling of the Constituent Aggregates from the Cold Bins at the Asphalt Plant

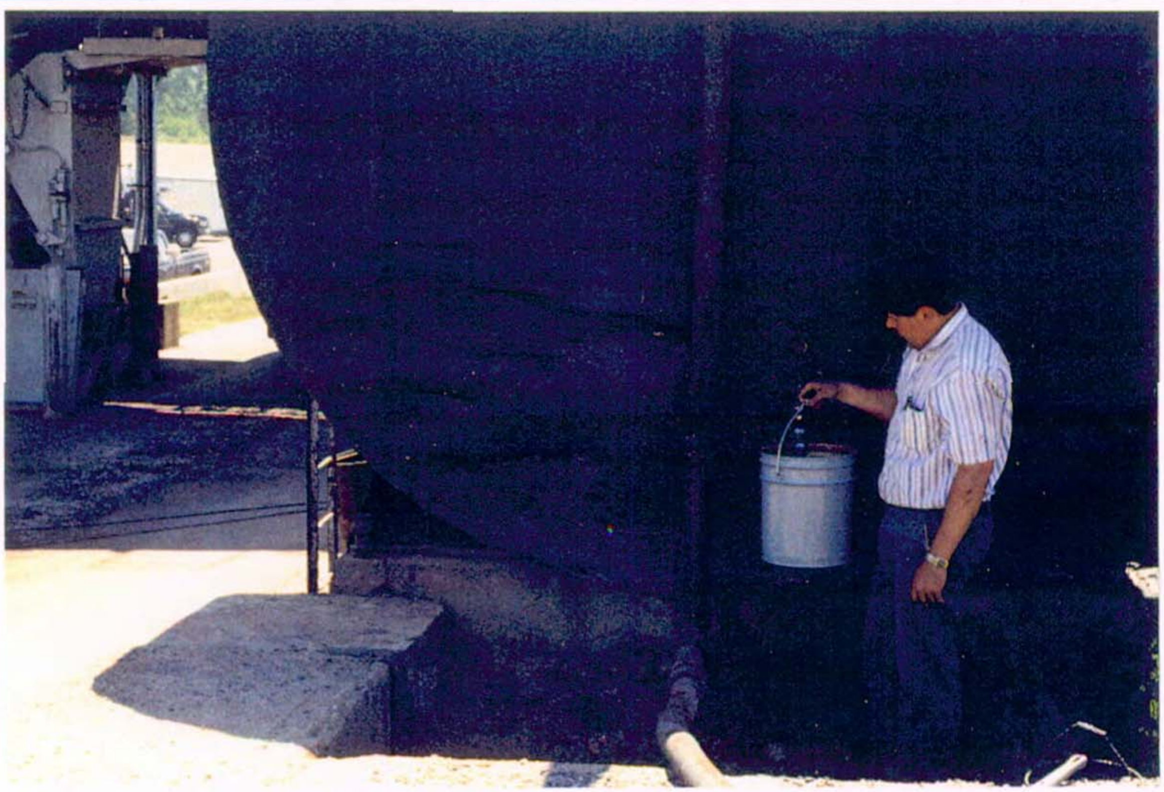

Photo 12 - Sampling of the Asphalt Cement at the Asphalt Plant

Photo 13 - Nuclear Gauge Density Measurement on the Final Surface Layer and Lane Markings

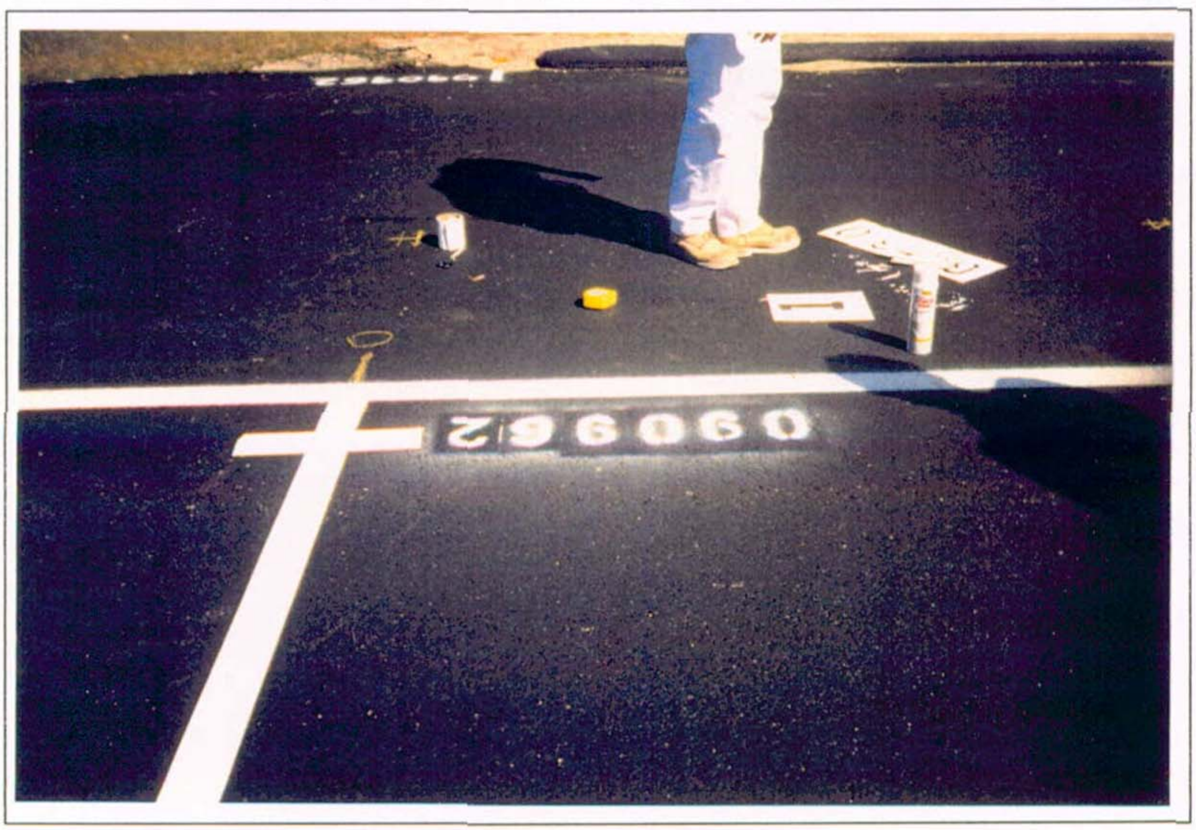

Photo 14 - Pavement Markings at Station 0+00 of Section 090962 on the West Bound RAP Lanes of the Project

Photo 15 - Hot Mix Sampling from Hauling Trucks at the Asphalt Plant for QC/QA Testing, Laboratory Shown at Lower Right Corner of Photo

Photo 16 - Soneco Northeastern Inc. Cedar Rapids Model H60B Batch Mix Asphalt Plant at Montville, CT